

RECONSTRUCTION OF THE COMMON BILE-DUCT.

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THERE are certain cases where the common bile-duct is obstructed or destroyed in which cholecystenterostomy is unwise or impossible. These cases present some of the greatest difficulties in surgery, and, with the increase of operative treatment upon the gall-bladder and ducts, it is found that they are not so uncommon as was at one time believed. They may be grouped under the following headings: (1) Accidental injury and removal of a portion of the common duct in performing the operation of cholecystectomy; (2) Injury of the hepatic or common ducts owing to the absence of a cystic duct; (3) Certain cases of early chronic pancreatitis; (4) Certain cases of advanced chronic pancreatitis; (5) Combined carcinoma of the gall-bladder and common duct; (6) Some cases of carcinoma of the head of the pancreas; (7) Obstruction of the common bile-duct from scar tissue, either within or without the lumen of the duct.

These groups will not all present the same problems; for in the first three the common bile-duct is either of normal size or is collapsed, while in the last four it may be considerably dilated.

1. Accidental Injury of the Common Duct during Operation of Cholecystectomy.

—This is much less common than was at one time believed. Fowler⁴ quotes Kehr as having had sixteen such injuries during one thousand cholecystectomies, and Jacobson has shown that injuries to the common and hepatic ducts are usually the result of operative accidents. Probably injury is much more common than one would be led to believe from a study of the literature, for many surgeons are shy of reporting their own errors. The conditions which may place the duct in danger are, however, so many that it is probable that there are very few surgeons frequently performing cholecystectomy who have not at some time or other injured the duct. In the early days of the operation, when it was customary to commence removal of the gall-bladder from the fundus, it was very easy, if there were many adhesions around Hartmann's pouch, to pull up a loop which was formed of the common and hepatic ducts, and to divide this loop right across in the belief that it was a cystic duct. Before it was the custom to examine the common bile-duct as a routine procedure, it was probably not infrequently ligatured before the cystic duct was divided, and thus the accident was entirely overlooked. The case which first directed my attention to this accident was of this nature. The patient was returned to bed with no indication that there was any untoward condition; later, the hepatic duct gave way and a fatal peritonitis was produced. Even with the more general introduction of removal of the gall-bladder from the cystic duct end, the presence of firm adhesions around the neck of the gall-bladder may lead to a similar complication. In the second case in my series the accident was of this nature, but happily the presence of two openings was discerned in the wound and an immediate end-to-end suture was performed with satisfactory results. This led me to make the invariable rule that the cystic duct was never to be divided until all three ducts, namely, the hepatic, cystic, and common, were clearly exposed in the operative field. In spite of this precaution, accidents may still arise which are more prone to occur owing to some abnormality of the cystic artery. Both Mayo¹⁷ and Eliot³ have laid stress upon the danger of clamping the duct in attempting to pick up the retracted proximal end of a divided cystic artery. The danger is much increased if there have been many surrounding inflammatory changes from a chronic cholecystitis, and especially is this so if there is a fistula between the gall-bladder and the intestine, for in this condition the anatomical relationships may be so distorted that the common duct may be injured before its position is realized. Owing to the fact

that the gall-bladder has been removed, a cholecystenterostomy is of course impossible. As a general rule, however, attempts to explore the common duct will lead to an early recognition of the condition, and an end-to-end anastomosis is then usually performed. Even with this operation the results may not be entirely satisfactory, as there is a certain tendency for stenosis to occur at the site of the union. If the damage be overlooked, a permanent fistula will result. By the time the second operation is undertaken, the lower end of the common duct is often so contracted and collapsed that it cannot be found, and an end-to-end suture then becomes impossible.

2. Injury of the Common and Hepatic Ducts owing to an Absence of the Cystic Duct.—It is of interest to note that the possibility of this condition has been denied. Rolleston,²² in commenting on the case reported by Cucknell, states that this was probably an example of absence of the gall-bladder with dilatation and pouching of the upper end of the common duct. There has, however, occurred in my series a case in which the patient had a normal gall-bladder situated in the usual position and containing gall-stones. When the gall-bladder was removed, it was realized that there were left behind two divided hepatic ducts and a divided common duct. These were sutured together, and an after dissection of the specimen showed the complete absence of any cystic duct (*vide Fig. 159*). The two hepatic ducts entered the gall-bladder on one side, and the common duct emerged from it on the other. In such a condition—which must be very rare—it would seem impossible to avoid division of the attached ducts.

3. Certain Cases of Early Chronic Pancreatitis.—It occasionally happens, as in my first case of reconstruction, that a patient will present the symptoms of colic; that at operation no stones will be found; that the gall-bladder and common duct will not be dilated, but the pancreas may be hard and nodular, and a probe will fail to enter the duodenum. Under such conditions a faulty diagnosis is very likely to be made, and the duct regarded as unobstructed. If a cholecystenterostomy be not performed, it is probable that the increasing obstruction will be sufficient to cause the opening in the common duct to break down, and to lead to the formation of a permanent biliary fistula. At a second operation the lower end of the duct may be so altered that it cannot be isolated, and the upper end will be found open and discharging bile. A cholecystenterostomy may be impossible, either because the gall-bladder had been removed at the first operation, or because it has become too shrunken and contracted.

4. Certain Cases of Advanced Chronic Pancreatitis.—It may happen that a patient will present definite symptoms of common-bile-duct obstruction, but it is uncertain whether the obstruction is due to gall-stones or to the presence of chronic pancreatitis. At operation the gall-bladder is found distended. It is aspirated as a preliminary to performing a cholecystenterostomy. Instead of the thick tenacious bile which is usually found under these conditions, a thin white mucoid fluid escapes. This at once leads to the suspicion that the cystic duct is obstructed, and that the distention of the gall-bladder is due to mucus and not to bile. In order to settle the diagnosis an incision may be made into the common bile-duct, when the escape of a similar fluid clearly determines that the absence of bile is due to a failure on the part of the liver, and the ducts are distended with a so-called white bile. The surgeon is now in a difficulty. If the common bile-duct be sutured and a cholecystenterostomy performed, it is very probable that the wound in the common duct will give way and that a permanent fistula will be formed, so that it will appear safer to attempt to perform a union between the duodenum and the opening in the common bile-duct.

5. Combined Carcinoma of the Gall-bladder and Ducts.—It will sometimes happen that there is a carcinoma of some portion of the common duct together with gall-stones and a carcinoma of the gall-bladder. Under such conditions it may be impossible, owing to the extent of the disease in the gall-bladder, to perform a cholecystenterostomy. Moreover, if one growth be situated at the junction of the cystic and common ducts there will be no regurgitation of bile into the gall-bladder, and hence an operation of this sort would be of no benefit. If the growth be relatively high up, it may be a very difficult matter to perform a direct lateral anastomosis between the duct and the duodenum. In those

cases in which the growth is so localized that the surgeon is able to remove the diseased portion of the duct and the gall-bladder, the duct will be left completely divided, and there may often be a very considerable gap, so that an end-to-end suture becomes difficult or impossible. The same is true with an uncomplicated carcinoma of the duct, if it be situated so high that during its removal the cystic duct is separated from its junction with the common hepatic duct.

6. Some Cases of Carcinoma of the Head of the Pancreas—The conditions here will be identical with those occurring with a chronic pancreatitis; but the cases are even less satisfactory, for even if a new duct be made the carcinoma will have to be left *in situ*, where it will continue to grow. Mayo¹⁷ has laid stress on the unsatisfactory results of this operation. Of four cases, two died soon after the operation and the other two lived for less than eighteen months.

7. Obstruction of the Common Bile-duct from Scar Tissue, either within or without the Lumen of the Duct.—This condition is rare. Occasionally a stone impacted in the duct may ulcerate into the walls, and at the site of ulceration a fibrous stricture may develop. This is more prone to happen at the junction of the three ducts, for here the duct is less likely to dilate and overcome the stricture. Under these circumstances the gall-bladder is less likely to be distended, so that a cholecystenterostomy becomes impossible or useless, and some form of duct anastomosis or reconstruction will be necessary.

The operations which have been undertaken in an attempt to treat the foregoing conditions are many, and may be grouped as follows:—

1. Direct Suture.—This is the operation which is most commonly performed. In Jacobson's series there were 21 cases of end-to-end anastomosis combined with drainage of the hepatic duct, and 2 cases of end-to-end anastomosis without drainage of the duct. Eliot was able to collect 16 cases of primary suture for injuries and 7 of end-to-end suture after resection of the stricture. Two methods of operating have been carried out. In the one the ducts are directly united, and in the other they are joined around a T-shaped rubber tube. It is probable that either of these operations will only be feasible immediately after the duct is divided; that is, where obstruction has been removed or an accidental division has been recognized immediately. If a persistent biliary fistula be present, the lower end will generally be so contracted and shrunken that it will be impossible to find. It is, moreover, a little doubtful whether the operation of end-to-end suture is as ideal as would at first sight appear. If no tube is used, there is the possibility that the junction may constrict. Of my own two cases (Nos. 2 and 3), one remained perfectly well, but the other has since developed attacks of pain and jaundice. In Eliot's³ collected 23 cases there were 4 failures with recurrence of jaundice. Suture around a T tube would appear to be unsound theoretically, for it will only be possible for the tube to be removed from the duct by a process of ulceration or tearing of the junction, and hence an irregular opening will be left which is liable to constrict.

2. Lateral Choledochenterostomy.—The formation of an anastomosis between the duct and the duodenum will generally only be possible when the obstruction is low down and when no biliary fistula is present; that is, when the common duct is considerably dilated. Under such conditions the operation has not uncommonly been employed, although there has often been considerable difficulty in obtaining accurate apposition of the openings. For this reason Horz¹¹ advocated that the anastomosis should be performed around a rubber tube, the lower end of which is brought out through a second opening in the duodenum and drained externally, the tube being removed on the eighth day. Sasse²³ obtained very satisfactory results with choledochenterostomy, and advocated that the operation should be more frequently performed, and even undertaken in cases of obstruction by a calculus, thus allowing freer drainage of the duct. My own experience of this operation has not been satisfactory. The only case in which I performed it (No. 4) was one of chronic pancreatitis together with stones, and, although there was no leakage of bile, the patient collapsed and died four days after the operation. In order to make the anastomosis, it is necessary to angulate the duct and duodenum so as to bring them

into apposition, and the operation appears to cause undue stress upon the line of junction.

3. Re-formation of an Absent Common Duct.—When a portion of the common duct is entirely absent, an attempt must be made to form a new path along which the bile can enter the intestine. Of the many steps that have been taken to produce this result, some appear to-day to be fantastic, and must be simply regarded as interesting steps in the development of modern technique. They may be considered as follows:—

i. *Hepatico-enterostomy.*—Here a small portion of the liver was excised so as to leave a raw area, in which the bile-ducts were opened. An incision was then made into a loop of the jejunum, and the edges of the incision were sutured to the margin of the liver. This operation failed because the bleeding from the edge of the liver was difficult to control, it was difficult or impossible to suture the intestine to the liver, and there was danger of infection spreading from the intestine to the intrahepatic ducts.

ii. *Anastomosis between the Fistula and Duodenum.*—Operations of this sort were doomed to failure; for not only was it extremely difficult to perform an anastomosis between the edge of the fistula and the intestine, but a faecal fistula was likely to arise, or the walls were almost certain to fibrose and contract so that the path became contracted.

iii. *Direct Implantation of the End of the Divided Duct into the Duodenum.*—This operation, which was apparently first performed by W. J. Mayo,¹⁶ is the one most commonly adopted, and the one which would at first sight appear to be the most satisfactory. Several cases have now been reported. Fowler⁴ says that he has had several where the operation was performed after resection of cancer of the duct, and once after partial gastrectomy for cancer of the pylorus: the cases for carcinoma were on the whole disappointing. He reports another case in which the operation was performed after an accident to the duct, the hepatic duct being implanted in the duodenum around a tube, with very satisfactory results. One of Mayo's¹⁷ cases is now reported well ten years after the operation. Similar operations have been performed by Packard,¹⁹ Harrington,¹⁰ and White and Lund. In Packard's case an ulcer was found occluding the duct at the papilla of Vater. The common duct was isolated and cut off from the duodenum. It was directly anastomosed to the duodenum, the walls of which were folded over the duct in order that the latter might run an oblique course and hence have a valvular opening. Whenever the duct is sufficiently long to allow of it being drawn down, and for the gut wall to be folded over it so as to make a valve, this operation is unquestionably the one of choice. Unfortunately it not uncommonly happens that it is too short for this purpose. So large a portion of it may be destroyed that it cannot even be brought into contact with the duodenum, and much less is there sufficient to allow of a valvular opening. The formation of a valvular opening would seem to be essential; otherwise there is grave danger of infection spreading from the duodenum and leading to suppurative cholangitis. In certain cases the difficulty may be overcome by implanting it into a loop of the jejunum instead of into the duodenum. Such a case was reported by Jackson,¹² where an obstruction of the common duct together with a biliary fistula resulted from an operation for carcinoma of the stomach. The upper portion of the duct was dissected out and divided; the cut end would not reach the duodenum, and hence a loop of small intestine was brought up to it and sutured to the liver to relieve tension. The bile-duct was inserted obliquely into it, the anastomosis being made around a rubber tube. The small intestine should always be chosen in preference to the colon, for, as Weidemann²⁷ has shown, a junction between the gall-bladder and the colon in dogs is followed by a fatal ascending infection. It not uncommonly happens that even this step is not feasible, for it may not be possible to bring a loop of small intestine sufficiently high up without causing kinking of the large or small intestine.

iv. *The Use of Autogenous Grafts.*—Several attempts have been made to bridge the gap in the common bile-duct by the use of some other tissue. Giordano and Stropeni⁸ first made use of a portion of vein, and similar experiments were carried out with success in dogs by Giacinto and Luigi.⁶ In these cases, however, the vein was simply used to bridge the gap between the two ends of the duct, and thus the difficulty of forming a new

valvular opening was not encountered. Molineus¹⁸ also suggested the use of the appendix, but did not perform the operation in the living. Lewis and Davis¹⁴ first advocated the use of transplanted fascia from the abdominal wall, and successfully used this in experiments on dogs. Ginsburg and Speese⁷ have since quoted a case in which this method was used in a patient; but here again both ends of the duct were isolated, and the gap was closed with a portion of the posterior rectus fascia sutured around a tube. Leakage occurred, and it was found later that the distal end of the transplant and the tube had broken down. Resuture with reinforcement of the junction by the gastrohepatic omentum was successful.

These operations may have a certain value where both ends of the ducts are isolated, but even then the operation will be associated with considerable technical difficulty, and there will always be some doubt as to whether the graft has taken. When the lower end of the duct is absent they will be of little avail.

v. *Indirect Implantation*.—Most of the modern operations are based upon the method advocated by Sullivan,²⁴ who inserted a tube into the proximal end of the duct and then implanted the distal end of the tube into the duodenum. The free portion of the tube was then wrapped round with omentum in the hope that a fistulous tract would thereby be formed, and would persist after the tube was passed. A valvular opening into the duodenum was insured by suture of the tube into the duodenum after the manner of the Witzel method of gastrostomy. Fowler⁴ states that Sullivan²⁵ had but a single case which has remained perfectly well for eight years. Brewer¹ reported two cases, in one of which death occurred later, apparently from obstruction. Mann¹⁵ also reports a case which was greatly improved five months after the operation, but had not yet passed the tube. Wilms²⁸ five cases apparently all recovered in the end, but only after very prolonged treatment, more than one operation being necessitated in some of the cases. Fowler⁴ performed the operation in one case where obstruction returned three months later, and a similar result occurred in a case of Hagler's,⁹ where obstruction appeared seven months later and, post mortem, cholangitis with abscesses in the liver was found. Mayo¹⁷ lays stress upon the fact that stricture is likely to occur ultimately; but if it can be combined with direct union of some portion of the duct, so that there is a partial lining of mucosa, this tissue may grow around and ultimately give satisfactory results.

On theoretical grounds the operation would certainly appear to be faulty. The tube being held in non-contractile tissue is unlikely to be passed; the wall of the duct is formed of omentum alone, and thus at best is a fistulous tract; stenosis is therefore very likely to occur and lead to a recurrence of the condition.

The difficulties and drawbacks which are associated with all of the above methods led me to devise an operation, which I first published in 1915,²³ and which I have used in six cases with entire satisfaction.

TECHNIQUE OF OPERATION.

Exposure is gained by an upper right pararectal incision. In passing, I may say that I now invariably use this incision for all cases of disease of the stomach, duodenum, and gall-bladder. I find that it gives an admirable approach and a perfect view, so that I have never found it necessary to employ the Kocher, Mayo Robson, or Bevan incisions. Being placed wholly to the inner side of the rectus muscle, it does not interfere with the nerve-supply, and thus can, if necessary, be carried from the costal margin to the pubes without leading to any permanent weakening of the abdominal wall. The common bile-duct is now laid bare; if there has been a prolonged biliary fistula, the lower end will probably not be discovered; if there is a stricture or carcinoma, this is removed, if possible, so that there now remains a condition in which the upper end of the duct is patent, but is separated by a wide gap from the duodenum, making a direct implantation impossible. The upper border of the duodenum is now drawn upwards and sutured, so that the gap is as far as possible reduced. The largest size tube that will enter the cut end of the duct is inserted, and sutured in position with plain catgut. A flap is then cut from the anterior surface of

the duodenum, and is turned downwards. The upper part of the resulting opening is sutured until it is only sufficiently large to admit the tube. The tube is then inserted, and the flap turned upwards over it. In the upper portion the edges of the flap are sutured around



FIG. 154.—Showing duct divided and opening made into duodenum.

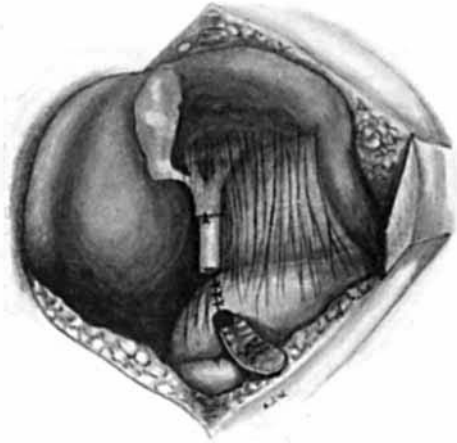


FIG. 155.—Tube sutured in duct. Opening in duodenum partly sutured.

the tube, and to the edges of the cut duct; below they are sutured to the wall of the duodenum which forms the structure adjacent to the posterior surface of the tube. For safety a small drainage tube is inserted down to the junction.



FIG. 156.—Tube inserted into duodenum. Duodenum drawn up as close as possible to common duct.

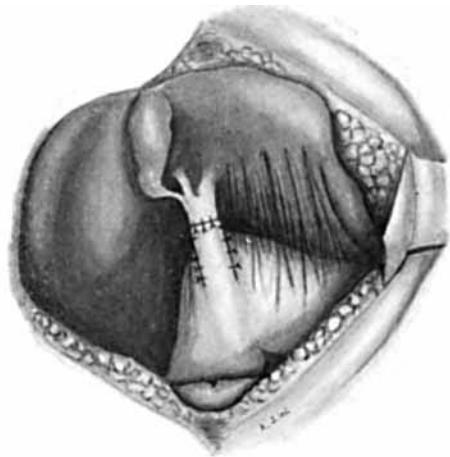


FIG. 157.—Duodenal flap sutured around rubber tube.

Figs. 154-157 are reproduced from 'Surgery, Gynecology, and Obstetrics,' Sept., 1915.

The operation in practice is very simple to perform. A new duct can readily be formed of practically any length; it is lined with mucous membrane, which is impervious to the action of the bile, and being lined by such a membrane will show no contraction; the tube

passes obliquely over the duodenal surface, and hence there will be a well-defined valvular action. Owing to the presence of the mucous-membrane lining it is not necessary for the tube to remain long in position. It can be sutured in place with plain catgut, which is dissolved in a few days, and thus there is little or no danger of the tube being retained.

Ginsburg and Speese⁷ have suggested, as a modification of this operation, that the flap be turned upwards instead of downwards. They claim that by this means the suture will be easier, for the flap will lie behind the tube. It will also have a better blood-supply. This modification, however, does away with the important valvular nature of the opening. I tried it in one of my cases, and was not at all satisfied with the technique. The flap being turned upwards is angulated at its pedicle, and suture in this position becomes much more difficult. A comparison of the two operations leaves me strongly in favour of the view that instead of being easier to perform it is more difficult, and the opening into the duodenum is physiologically much less satisfactory. I have found the former method so easy and so generally satisfactory that I have made a slight modification of it for use in those cases in which there is an obstruction low down in the duct. In the cases already mentioned in which there is an obstruction due to carcinoma or chronic pancreatitis, and in which the duct has been opened for exploratory purposes, so that cholecystenterostomy becomes a risky procedure, it is a perfectly simple matter to insert the tube into the lateral opening of the common duct instead of into the cut extremity, and then to reconstruct the new duct from the duodenal flap around the tube, so that there is, in fact, a new duct entering the lower part of the original one at a slight angle. The results of my own cases are classified in the following three appendices:—

Appendix A consists of 4 cases in which an injury was overlooked, or some method other than the reconstruction was performed. Of the 3 cases in which some form of repair was carried out, 1 died, and 1 has had some evidence of further obstruction. Of the 6 cases in which reconstruction has been performed, the results are on the whole satisfactory.

Appendix B consists of 3 cases in which the new duct was joined to the end of the divided duct. One, which had carcinoma of the common duct low down, and also carcinoma of the gall-bladder, died after resection of both carcinomata and reconstruction of the duct. The other 2, who had benign obstructions, are in perfect health four years and eighteen months respectively after operation. It is interesting to note that in one patient the hepatic ducts were both divided, so that two tubes had to be inserted and the flap sutured around them both.

Appendix C includes 3 cases where the new duct was united to the side of the common duct. One, who had an advanced pancreatitis, died seventeen days after the operation; but the tube had been passed and there was no evidence of leakage. The other 2 cases recovered completely from the operation, but since one of these had an incurable carcinoma of the common bile-duct and the other an advanced chronic pancreatitis, they are not free from symptoms. Thus, of 6 cases there are 4 recoveries and 2 deaths.

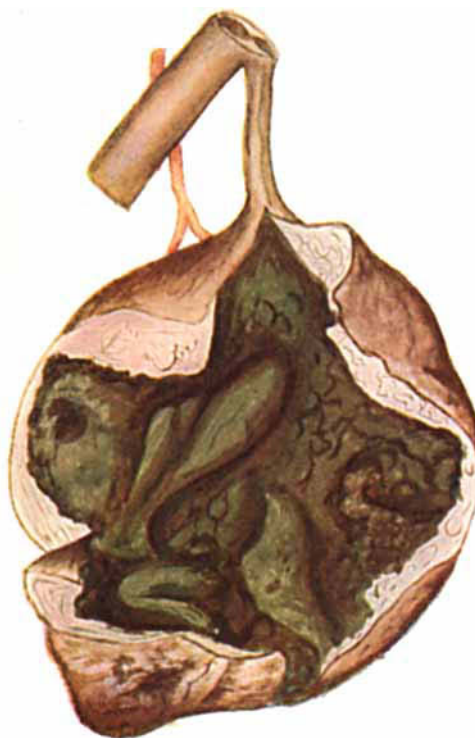


FIG. 158.—Acute cholecystitis. Accidental removal of portion of common duct. (*Appendix A, Case 1.*)

CLASSIFIED CASES.

Appendix A.—CASES TREATED OTHER THAN BY RECONSTRUCTION METHOD.**Case 1.**—Acute cholecystitis. Accidental division of common duct overlooked. Death.

M. J. C. Patient, age 53. History of gall-stones many years.

Acute cholecystitis. Cholecystectomy, Feb. 25, 1913, commencing at cystic duct. Common duct accidentally overlooked and ligatured. Onset of peritonitis three days later.

Second operation.—Drainage of peritoneum. Died.

Post-mortem.—Division of common duct ligatured on both ends. Leakage from upper end. Peritonitis. Dissection of specimen revealed the presence of about one inch of common duct (*Fig. 158*).

Case 2.—Accidental division of common duct. End-to-end suture. Recovery.

M. W. Patient, age 40. Gall-stones accidentally discovered by gynæcologist during operation for fibroids.

Cholecystectomy, Oct. 15, 1915, commencing at cystic duct. Accidental division of common hepatic and common bile-ducts. Immediate suture. Slight leakage of bile for nine days. Complete recovery.

Case 3.—Congenital absence of cystic duct. Division of hepatic and common ducts. End-to-end suture. Incomplete recovery.

E. H. Patient, age 38. History of gall-stones five years.

Cholecystectomy, June 2, 1916. After removal, two hepatic ducts and common bile-duct found to be divided. Immediate end-to-end suture.

Dissection of specimen revealed two hepatic ducts entering one side of gall-bladder, and common duct emerging from the other (*Fig. 159*). Slight leakage of bile two and a half weeks. Passage of bile to intestine. Complete operative recovery.

Last note, Oct. 18, 1920. Keeping very well, but every few months has attacks of collapse, with a little pain, followed by profuse jaundice. Attacks last about two days, but are becoming less frequent, hence further operation not advised.

Case 4.—Gall-stones. Chronic pancreatitis. Cholechooduodenostomy. Death.

S. W. Patient, age 65. Ten weeks' history of pain and jaundice.

Operation, Jan. 28, 1920. Gall-bladder distended, many adhesions, many calculi. Three calculi in common bile-duct. Much dilated. Large mass in region of head of pancreas. Opening in side of common bile-duct directly anastomosed to opening in side of duodenum. Good progress for three days. Collapsed and died.



FIG. 159.—Congenital absence of cystic duct. Two hepatic ducts entering the side of gall-bladder. Common duct emerging from opposite side.

These cases may be tabulated thus :—

	TOTAL	DIED	IMPROVED	RECOVERED
Overlooked division of duct ..	1	1	—	—
End-to-end suture after division ..	2	—	1	1
Lateral anastomosis for obstruction ..	1	1	—	—
	<u>4</u>	<u>2</u>	<u>1</u>	<u>1</u>

Appendix B.—CASES TREATED BY RECONSTRUCTION METHOD. NEW DUCT JOINED TO END OF DIVIDED DUCT.**Case 1.**—Early chronic pancreatitis. Exploration of duct. Permanent biliary fistula. Reconstruction of duct. Recovery.

J. L. Patient, age 27. Eight years' history of pain and jaundice. Vomiting.

Operation, May 13, 1914. Gall-bladder not dilated. Common duct not dilated. Head of pancreas hard and nodular. Common duct explored. Passage not free. Sutured. Gall-bladder

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drained. (It would have been better to have performed cholecystenterostomy). Developed permanent biliary fistula.

Second operation, June 3, 1914. Reconstruction of common bile-duct by flap method. Complete recovery with no leakage. Passed tube on 11th day.

Last note, Sept. 11, 1918. Perfectly well, except for occasional slight attacks of abdominal pain. Has served in the army through war. Fighting in Gallipoli, April to December, 1915.

Case 2.—Cholelithiasis. Acute cholecystitis. Cholecystectomy. Exploration of common duct. Stricture of common duct. Biliary fistula. Reconstruction of common duct. Recovery.

S. E. Patient, age 64. History of gall-stones several years. Severe pain twelve days.

Operation, Aug. 11, 1919. Gangrenous cholecystitis. Cholecystectomy. Stone in stump of cystic duct. Removed. Duct sutured. Developed permanent biliary fistula.

Second operation, Oct. 1, 1919. Opening found at junction of two hepatic ducts; stricture just below. Two hepatic ducts divided. Tube inserted into each. Flap made from duodenum and sutured around tubes. Uninterrupted recovery. Tubes passed on 14th and 15th day.

Last note, Feb. 4, 1921. Complete recovery. No pain, full diet, never any symptoms since operation.

Case 3.—Cholelithiasis. Carcinoma of gall-bladder. Carcinoma of common bile-duct. Cholecystectomy. Reconstruction of common duct. Death.

J. U. Patient, age 60. Thirty years' history of gall-stones. Constant jaundice ten weeks.

Operation, Jan. 19, 1921. Cholelithiasis. Carcinoma of gall-bladder. Cholecystectomy. Dilatation of common bile-duct. Carcinoma of common bile-duct just above duodenum. Growth resected. Tube inserted into upper end of common duct. Reconstruction of flap. Died four days later.

These cases may be tabulated thus :—

	TOTAL	DIED	IMPROVED	RECOVERED
Chronic pancreatitis	1	—	—	1
Stricture of common duct	1	—	—	1
Carcinoma of duct and gall-bladder ..	1	1	—	—
	3	1	0	2

Appendix C.—CASES TREATED BY RECONSTRUCTION METHOD. NEW DUCT JOINED TO SIDE OF COMMON BILE-DUCT.

Case 1.—Chronic cholecystitis. Advanced chronic pancreatitis. New duct joined to side of common bile-duct. Death.

W. E. Patient, age 48. Six months' history of pain and jaundice.

Operation, Aug. 1, 1917. Gall-bladder small and shrunken. Adherent to colon. Common duct dilated. Head of pancreas hard and enlarged. Cholecystectomy. Opening made in side of dilated common duct. Tube inserted and sutured. Flap of duodenum sutured around tube. Wound healed. Passed tube on 9th day. Gradually sank, and died seventeen days later.

Case 2.—Cholelithiasis. Cholecystitis. Carcinoma at junction of ducts. New duct joined to side of hepatic duct. Recovery.

A. M.—Patient, age 48. History of stones many years. Persistent jaundice 6 weeks.

Operation, Sept. 24, 1919. Liver enlarged. Gall-bladder distended. Full of stones and mucus. Growth at junction of hepatic, cystic, and common bile-ducts. Hepatic duct much dilated. Growth adherent to structures around preventing removal. Opening made in hepatic duct. Tube inserted. Modification of flap operation as suggested by Ginsburg and Speese performed. (This was not so satisfactory as the usual operation. The opening was not valvular, and it was more difficult to obtain accurate suture.)

Cholecystenterostomy then performed to allow of drainage of gall-bladder and cystic duct secretion. Primary union. Complete disappearance of jaundice in four weeks.

Last note, Feb. 6, 1920. No jaundice. Subject to attacks of pain and vomiting. Wasted. Great muscular weakness; probably progression of carcinoma.

Case 3.—Carcinoma of head of pancreas or chronic pancreatitis. Failure of secretion of bile. Exploration of common bile-duct. New duct joined to side of common duct. Recovery.

J. M. Patient, age 62. Persistent jaundice three months.

Operation, Oct. 6, 1920. Gall-bladder distended; no stones. Contained mucoid material suggesting cystic-duct obstruction. Common duct explored. Similar mucoid fluid. Hard mass

in region of head of pancreas. Tube inserted into opening made in common duct. Flap of duodenum sutured around tube. Gall-bladder sutured. Vomit contained bile second day after operation. Ten days later, stools coloured. No leakage of bile. Wound healed. Tube passed on 14th day.

Last note, April 14, 1921. No further jaundice. Weak. Considerable flatulence. Some attacks of pain much relieved by taking pancreatic extract.

These cases may be tabulated thus:—

	TOTAL	DIED	IMPROVED	RECOVERED
Chronic pancreatitis ..	2	1	1	—
Carcinoma of duct ..	1	—	1	—
	3	1	2	0

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