EXTERNAL AND INTERNAL BILIARY FISTULÆ FOLLOWING CHOLECYSTECTOMY

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In 1923,* we published our experiences with our first two transplantations of complete external biliary fistulae. We have now done the operation upon ten patients, with the following results. Six are well and free from symptoms. One has been a complete failure in that the complete external biliary fistula has returned. She will have another attempt at transplantation in three months more. One is a partial failure in that she is suffering from intermittent frequent attacks of biliary obstruction or infection so

that she does not enjoy life, and will probably require reestablishment of the external biliary fistula. Two died following the operation.

We have published the operative plan as we have employed it, and have laid down a few rules which we have learned as the result of our experiences with these cases which may be helpful to others. The most important of these is, we believe, that the fistulous tract may be cored out of the abdominal wall, but should not be dissected free from the under surface of the liver, from which it doubtless receives a good deal of its nourishment, which in turn helps to prevent contraction. (Fig. 1.) It therefore becomes necessary to mobilize the stomach, duodenum or jejunum so that it can be brought up to the anterior surface of the liver, the entire fistulous tract pushed into

Fig. 2.—The anterior surface of the liver freed from the parietal peritoneum and turned down to meet the jejunum (or pre-pyloric gastric region) pulled up, with the opening in the intestinal canal into which the sinus is to be transplanted. One insert shows a method of making an opening when jejunum is used, the other insert showing fistula transplanted and bowel pulled well up against the liver edge so that there is no free fistula.
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the intestinal canal, the wall of which is sutured about it snugly by a purse-string suture, and the stomach or bowel—whichever is used—sutured to the capsule of the liver. All of the fistulous tract which is cored out of the abdominal wall is pushed through the lumen of the stomach or bowel, so that there is no free, unnourished fistulous wall between the liver edge and the intestinal wall. (Fig. 2.)

We have learned also that the production of complete external biliary fistulæ is by no means a simple procedure, and in dealing with the ten cases

in which we have attempted to produce complete external biliary fistulæ, we have encountered and demonstrated at operation four cases in which spontaneous internal biliary fistulæ had occurred, the duodenum or stomach attaching itself to the hepatic duct above a stricture and a small and inadequate spontaneous fistulous canal being established between the two. In all of these four cases, the spontaneous fistulous canal was not of sufficient size to prevent back pressure and jaundice, and in each case it was necessary to detach these spontaneous fistulæ and to establish complete external biliary fistulæ. (Fig. 3.)
In our experience in establishing these complete external biliary fistulae, we have had some surprising occurrences. In one of our earliest cases in which the common and hepatic ducts had been completely excised at a previous operation elsewhere, a very satisfactory preliminary external biliary fistula was established by suturing a large catheter into the hepatic duct where several months before it had been cut across just at the point where the hepatic divided into right and left branches. Bile drained well through the tube for two weeks, at which time the tube came out. For a few days there was good external biliary drainage through the external biliary fistula without the tube, when suddenly all external biliary drainage ceased, the stools became colored with bile, and the patient was not jaundiced. We were considerably disturbed by this first occurrence of this event in our experience, and presumed that either we were wrong in our observation that the entire hepatic duct had been excised, or a spontaneous internal fistula had been established. Within a few weeks bile ceased entering the intestinal canal, the patient returned to the hospital deeply jaundiced, and was reoperated upon. Again a complete obstruction was found in the hepatic duct, and again a tube was sutured into the hepatic duct and an external biliary fistula established. Again, after the removal of the tube, the external flow of bile ceased, the stools became colored, and quite evidently another spontaneous internal biliary fistula had been established. Again at the end of a few weeks bile ceased entering the intestinal canal, the patient was deeply jaundiced, developed bleeding from wound granulations, and later died without further operation.

We have in contradistinction to this experience two other much more satisfactory patients—one who came to us with a post-operative, very narrow stricture of the hepatic duct due to that structure having been clamped at the previous cholecystectomy (done elsewhere), in whom a complete stricture followed a plastic repair of the strictured duct, and in whom we later produced a complete external biliary fistula. The other patient came to us with complete loss of her hepatic duct following a cholecystectomy done elsewhere. In both of these cases, following the production of complete external biliary fistulae by suturing a tube into the hepatic duct, soon after the removal of the tubes completely satisfactory spontaneous internal biliary fistulae developed, as was evidenced by the sudden stopping of all external biliary discharge and the stools becoming well colored. Both cases are in very satisfactory condition—one at the end of three months and the other at the end of twelve months. No jaundice has appeared in either case, the stools have remained well colored, and both patients are in excellent health.

It is evident, then, that while some spontaneous internal biliary fistulae may be so situated and possibly of such calibre that they will function satisfactorily and not contract, other less satisfactory spontaneous internal fistulae will occur, will function as internal fistulae long enough to permit the external fistula to heal, and later contract and close, necessitating reoperation and, as in one of our first cases, again exposing the patient to the
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same danger of closure following the production of a second external biliary fistula.

As we suggested in the publication seven years ago of our description of our first two experiences with this condition, we presume that complete external biliary fistulae remain open from the fact that the secretory pressure of bile is in all probability greater than the ability of the vascularized scar tissue in the sinus tract to contract. The balance of control in this situation must, however, be within quite narrow limits, and when in complete external biliary fistulae even a very small spontaneous internal biliary fistula is established between the duct and the duodenum, pressure within the fistulous tract distal to the spontaneous fistula becomes lowered and the ability of scar tissue in the external sinus tract then controls the situation and contraction and closure of the sinus results.

The explanation as to why some spontaneous internal fistulae remain open satisfactorily and why some close spontaneously, and as to why complete external biliary fistulae do not close can be approached only upon a problematical basis.

It seems at least probable that external biliary fistulae, as we first suggested in our original article, may well retain a greater ability to resist contraction when well vascularized, as when the sinus is completely in contact with the under surface of the liver throughout its entire extent, where certainly an excellent and profuse blood supply is at hand to supply vascularization. This same feature may possibly supply the controlling factor in spontaneous internal biliary fistulae when the duodenum or stomach attaches itself directly to the under surface of the liver over the sinus, and spontaneous anastomosis then occurs between the duodenum and the vascularized sinus in the liver bed, producing a direct fistula which will not contract as has been the case in the spontaneous internal fistulae spoken of above. When, however, the fistulous tract burrows for any distance to reach the duodenum and a free sinus of any length unvascularized by attachment to the liver bed is established, contraction as the result of bile irritation, infection, and lack of blood supply probably then occurs.

From our experience with the production of complete external biliary fistulae, we have learned then that spontaneous internal biliary fistulae are at times the cause of failure of external biliary fistulae to remain open until such time as they are ready for transplantation, and that if we wish to protect the patient against the possibility of his external biliary fistula being either completely destroyed or made ineffectual by the spontaneous establishment of a communication between the fistulous tract and the duodenum, measures must be taken to lessen the likelihood of such a calamity.

Because of our experiences with a patient who has developed inadequate spontaneous internal fistulae, thus spoiling the external fistulae before they could be transplanted, we have attempted to prevent this undesirable event by turning up the omentum over the duodenum and suturing its right free border to the posterior parietal peritoneum just proximal to where that
structure passes over unto the first portion of the duodenum and over the pylorus and pre-pyloric region. (Fig. 4.) We have done this now in but two cases, but we hope that the interposing of this structure between the fistulous canal and the duodenum will at least lessen the chances of the occurrence of a spontaneous internal biliary fistula and destruction or impairing of the complete external biliary fistula.

We have now operated upon one of the cases in which omentum was interposed as described above between the fistulous tract and the duodenum and stomach, and it in no way interferes with the ease with which the transplantation of the external biliary fistula can be done. Based upon our experience with only this single case, it seems possible that it may prove of value, since it makes one able to conduct the transplantation of the cored-out fistula almost extraperitoneally.

In this case, after the abdomen had been opened and the fistulous tract prepared for transplantation by coring it from the abdominal wall, an opening in the interposed omentum was made over the portion of the stomach close to the pylorus and a sufficient amount of stomach to reach readily up to the edge of the liver at the base of the free portion of the fistulous tract pulled out with Allis forceps. The edges of the rent made in the omentum were then sutured to the base of the apex of stomach pulled
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through the rent in the omentum, thus making the portion of the stomach into which the fistula was to be transplanted largely extraperitoneal. (Fig. 5.)

The stomach we believe should be employed when possible: (1) because we know from our experience with one of those cases now well seven years after transplantation of a fistula into the stomach, and from everyone's experiences with cholecystgastrostomy in carcinoma of the head of the pancreas, that the stomach tolerates the introduction of all bile into it satisfactorily; and (2) because, should leakage occur following the transplantation of the fistula, it will be of much less serious consequence if it be a gastric fistula rather than a duodenal one.

With the pre-pyloric portion of the stomach pulled out through the opening in the omentum and that structure sutured to the stomach to make it extraperitoneal, a small opening is made at the apex of the pulled-out stomach at the point which will readily reach the anterior surface of the liver at the base of the fistula, a suction tube passed into the held-up opening, and any excess of gastric contents sucked out. Two stitches are passed through the capsule (and scar tissue) on the under surface of the liver, one on either side of the fistulous canal and just beneath the shelving edge of the liver. These are then passed through the stomach wall superior and to either side of the opening in the stomach, as will be seen by Fig. 6, will be the sutures which are to approximate stomach behind the implanted fistula when the stomach is brought up to the edge of the liver. It is necessary to insert these stitches before the sinus tract is implanted into the opening in the stomach, as it is not possible to get them in after the sinus has been inserted into the gastric opening.
DISCUSSION

One should have in mind our suggestion in the original article, that a short section of rubber catheter of the proper length to fill the free part of the fistula dissected from the abdominal wall and not attached to the liver should be placed in the end of the sinus, extending up that tract just a short distance beyond the free edge of the liver. The rubber tube should be inserted so that the purse-string suture in the stomach about its point of implantation may be tied tightly to prevent leakage without danger of obstructing the sinus. It should extend just beyond the free edge of the liver so that its upper free end on angulation may not cause pressure and perforation of the free portion of the sinus unattached to the liver.

The plan of pulling the fistulous tract well into the lumen of the stomach by means of a counter incision in the stomach and the fixation of the fistulous tract by sutures within the stomach is shown in Fig. 6.

CONCLUSIONS

The surgical demonstration of inadequate spontaneous internal biliary fistulae between the hepatic duct and duodenum or stomach above strictures of the hepatic duct after cholecystectomy is reported.

The spontaneous closure and entrance of bile into the intestinal tract from complete external biliary fistulae by undemonstrated but presumably certain spontaneous internal biliary fistulae is reported, as is the satisfactory progress of these cases over a period of three and twelve months respectively.

The possibility of destruction of the preliminary complete external biliary fistulae by the occurrence of inadequate spontaneous internal biliary fistulae, together with a report of such an occurrence twice in the same individual, is reported and a plan to prevent it is proposed.

DISCUSSION: DOCTOR GATEWOOD, of Chicago, said that he had seen a number of cases in which the gall-bladder had been removed and subsequent obstruction due either to stricture or to complete cutting of the duct occurred. In the first cases he attempted by the method suggested by W. J. Mayo to bring the stomach, or the intestine, to the stump of the common or the hepatic duct. It is an operation which is time-consuming and which is difficult in patients who already have a considerable handicap. After he saw Doctor Lahey's first communication he wondered why the fistulous tract had not been used before, and since then he had used it in three instances. In each of these he had been able to use the stomach. He prefers the stomach if at all possible, first, because the gastric fistula is preferable to the duodenal in case they have a leak, and second, because the stomach seems to have less bacterial flora, and, at least from an experimental standpoint, secondary infection of the liver is not so likely to follow. In all three of these cases he had had, at least temporarily, a good result. One of these patients he reported about two years ago as being perfectly well for a year and a half. Since then she has had attacks of jaundice, and while relatively well, evidently has some intermittent obstruction. The other two patients are still well, but he was somewhat dubious as to whether these fistulous tracts will subse-
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quently contract in spite of the fact that they are wide open. He could introduce his little finger into one tract at the time of the operation. He would like very much to know what Doctor Lahey's ultimate results had been in cases of this type.

Doctor Frank H. Lahey, of Boston, replied these are almost hopeless cases. The surgeon is faced with the situation that there is nothing else but this to do. At least, he knew of nothing else to do. They are not the cases in which one can do duct anastomoses and one approaches these with his mind at ease as far as end-results go. They are doomed to exist as well as they can with complete external biliary fistulae or to take the best results they can get with transplantations. They are very likely to have more or less infection within the sinus, and certainly in the beginning to have repeated attacks of jaundice.

As to the stomach, he was certain that it is more desirable to make the transplantation into the stomach rather than the duodenum, because a gastric fistula is much less dangerous than a duodenal or jejunal fistula, and furthermore, these cases will require, he believed, more than one operation frequently. There will be failures occasionally but even though they fail, one can again excise the fistula and implant it again.

As to end-results, two cases now, one is alive eight years and another alive seven years. They have had attacks of jaundice. One has had jaundice, off and on, for several years. The other one has had no jaundice and that was a gastric implantation.

One should not be alarmed if occasionally they leak during their period of recovery. He thought that they sometimes leak because the attachment of the sinus tract to the liver may pull off because of vomiting or from moving about, but even with this leakage some of these have closed and remain dry.