CATHETER DUODENOSTOMY: A SAFEGUARD IN GASTRIC RESECTION

Report of Eleven Cases

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THE proper closure of the duodenal stump is a critical step in the safe performance of gastric resections of the Billroth II type. Every surgeon with experience in gastric resections can recall patients in whom leakage from the duodenal stump has resulted in disaster; at best, a stormy convalescence for the patient; at worst, death. Welch[1] deserves the credit for calling attention to the simple maneuver of catheter duodenostomy which can obviate this dangerous complication.

The utilization of a deliberately created duodenal fistula at the time of gastric surgery was reported as early as 1881 by Billroth.[2] Current interest was stimulated by Welch, in 1949, who pointed out the potential usefulness of a catheter placed in the duodenal stump when proximity of pancreatic or common bile ducts might interfere with proper closure; nutritional depletion of the patient with possible impairment of normal healing processes was an additional reason for employing this safeguard. He stated that he had used the procedure in 2 patients. Welch's view was endorsed by Priestley and Butler.[3] They reported 2 cases in which catheter duodenostomy had been performed, and expressed the belief that, when leakage from the duodenal stump was considered a possibility, it was preferable to drain the duodenum directly by catheter rather than the periduodenal area. Ross and Warren[4] mentioned simultaneous catheter duodenostomy and catheter jejunostomy as a safeguard in gastric resection.

It is probable that a safe closure of the duodenum may be performed in nearly every instance if the surgeon will observe three points: (1) take time to mobilize sufficient duodenum; (2) employ pancreatic capsule or fibrous ulcer base as the outer layer of the closure when scar or inflammation makes this desirable; (3) satisfy himself that the gastrojejunostomy is well-placed mechanically, with little likelihood of obstruction. (Back pressure from afferent loop obstruction is probably the principal cause of leakage from a duodenal stump; the rarity with which a perforated ulcer will leak after surgical closure, no matter how flimsy such a closure may be, lends support to this view.)[5] There are, nevertheless, occasional instances in which scarring and inflammation about the duodenum and pancreas will render closure of the duodenal stump difficult and time consuming, and the surgeon will feel uneasy about the safety of the closure. If in addition, the patient is nutritionally depleted and has poor healing propensities, a situation exists where the slightest mal-

functioning of the new gastrojejunostomy may result in leakage. It is in cases of this sort, precisely, where a catheter duodenostomy should be employed; it will save the surgeon time and worry, and may save the patient's life.

In the past 2 years catheter duodenostomy has been performed in 11 instances on one service (S.O.H.) at the Cleveland Clinic. The incidence was, approximately, one in ten gastric resections for all causes. The first person upon whom the procedure was employed (case 1) was an elderly patient undergoing an emergency operation for persistent bleeding from a duodenal ulcer. A formal closure of the duodenal stump (after ligation of the bleeding vessels in the ulcer bed) could have been performed, but the duodenostomy greatly hastened the operation in a poor risk patient. Encouraged by the uneventful convalescence in this patient, we used the procedure upon subsequent patients in whom the duodenal closure appeared to represent an increased hazard. It will be seen from the individual case reports that catheter duodenostomy has been employed with gastric resection for duodenal ulcer, for pyloric and prepyloric ulcer, and for antral cancer with extension into the duodenum. It has been used both with and without a supplementary feeding jejunostomy. (A jejunostomy should undoubtedly be constructed at the time of the catheter duodenostomy if the patient is nutritionally depleted, or if stomal obstruction seems possible on a mechanical basis.)

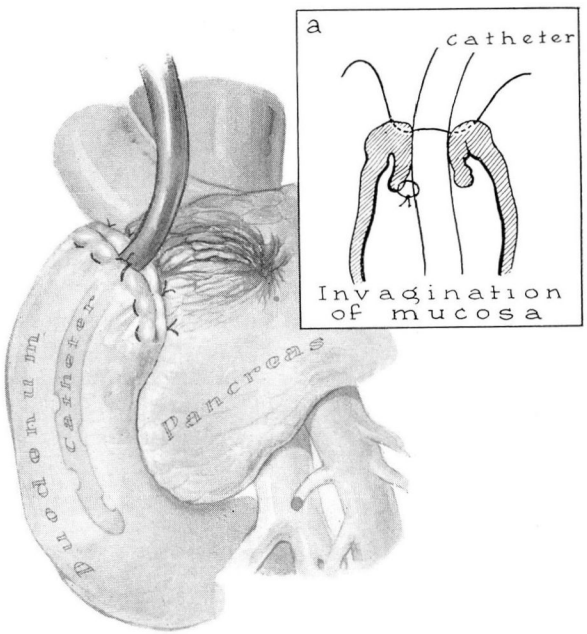

FIG. 1. (a) The single layer turn-in with interrupted mattress sutures of the Halsted type is shown. The insert shows placement of the first part of the mattress suture, and also the suture which anchors catheter to duodenal wall.

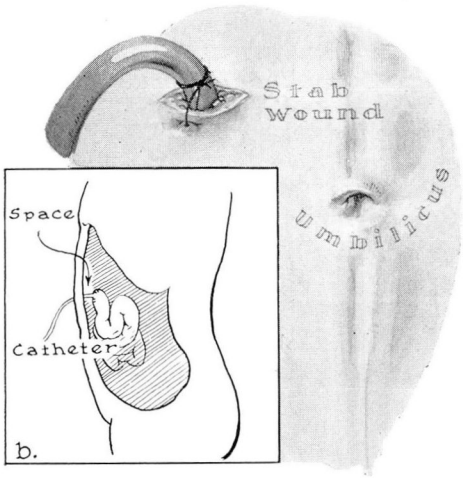

FIG. 1. (b) The usual location of the stab wound is demonstrated. The insert shows the absence of any special walling off as an omental tunnel.

Technic

The technic employed has been simple. We believe that inversion of the mucosa is the single most important step; failure to obtain a good inversion may result in prolonged drainage after the catheter has been removed (fig. 1a). Mucosal inversion about the catheter may be accomplished by means of a purse-string suture as described by Welch. In the majority of our cases, however, interrupted 000 silk sutures were used in a single layer closure and the catheter led out at any convenient spot, usually the center. A number 14 or 16 French catheter is a convenient size, with additional holes cut at the end. The catheter is introduced for a distance of 4 to 6 inches, and secured to the duodenal wall with a single suture of 000 silk also passing through the wall of the catheter, and tied tightly. (This suture will presumably slough through in 5 or 6 days.) The closure is tested by introducing sterile saline solution through the catheter. The catheter is led out through a stab wound directly over the duodenal stump (fig. 1b). We have not employed a tunnel of omentum, as shown in the illustration in Welch's paper, reasoning that the catheter was analogous to one employed for draining the common duct where such walling off is deemed unnecessary. In several patients there was definite drainage of duodenal contents outside the catheter, either through the same stab wound or by way of an additional drain. This extravasation had no detectable deleterious effect upon the patient.

The postoperative management of the catheter, in our experience, may follow the same principles employed in catheters draining the common bile duct. Gravity drainage may be utilized for the first few days, or even suction drainage if the closure seems insecure. If the drainage is excessive, it may be fed back to the patient through the jejunostomy, if one has been constructed;

such re-feeding will usually not be possible for a day or two, until normal bowel motility has been restored. By the fourth postoperative day, the drainage bottle may usually be raised to bed level. Daily drainage will generally drop to 50 or 100 cc. If there is no leakage around the tube, the catheter may be removed on the sixth or seventh day. Continued drainage of large amounts of duodenal contents, or drainage about the catheter, usually indicates imperfect functioning of the new gastrojejunostomy, and removal of the catheter should be delayed accordingly. Once the catheter is drawn out, the fistula closes rapidly in nearly every case. In one patient the fistula reopened for a few days several months after the operation, and 2 patients developed abscesses in the stab wounds. There were no serious complications related to the catheter duodenostomy.

Case Reports

Case 1. A 58 year old white man came to the Cleveland Clinic in January 1950, complaining of intermittent epigastric distress of 6 years' duration. An x-ray diagnosis of duodenal ulcer had been made in 1944. He was admitted for treatment of a subdeltoid bursitis, but developed massive melena while in the hospital. The bleeding failed to stop despite medical management. After 5 days and transfusions of 3,000 cc. blood, an emergency gastric resection was performed January 30, 1950 for a bleeding, penetrating duodenal ulcer. A catheter duodenostomy was desirable because of fixation of the duodenum to the pancreas by inflammation.

The drainage from the duodenostomy decreased steadily and the catheter was removed on the seventh postoperative day. No further drainage was observed. He was discharged on the ninth postoperative day. The patient was well on follow-up examination in March 1952, 2 years later.

Case 2. A 61 year old obese white man came to the Clinic because of ulcer distress of 20 years' duration which had failed to respond to medical treatment. During the preceding 6 months he had experienced 3 episodes of hematemesis and melena.

X-ray examination of the stomach revealed a gastric ulcer which was interpreted as presumably malignant.

On March 3, 1950 the patient had a subtotal gastric resection for a benign prepyloric ulcer. Catheter duodenostomy was performed because of inflammation and induration surrounding the duodenum; obesity contributed to the technical difficulty.

Postoperatively the patient was completely asymptomatic. The duodenostomy drainage steadily decreased and the catheter was removed on the seventh postoperative day. Drainage promptly ceased. The patient was discharged on the thirteenth postoperative day with all wounds healed. In a follow-up by letter in March 1952, 2 years after the operation, the patient was asymptomatic.

Case 3. The patient was a 59 year old white woman with a history of 18 years of severe intermittent epigastric distress. In 1946 and twice in 1948 she had operations upon her biliary tract for recurrent jaundice. She continued to experience epigastric distress, chills, fever and jaundice and, in March 1950, was admitted to the Cleveland Clinic Hospital.

X-ray examination of the stomach revealed a duodenal deformity. Operation on March 24 consisted of a transduodenal choledocholithotomy, vagotomy, gastroenterostomy and catheter duodenostomy for a duodenal ulcer and common duct stone. It was felt that the position of the ulcer could have induced the common duct obstruc-

tion. The duodenostomy was performed by introduction of a catheter into the opening already present in the duodenum; this was considered advisable because extensive cicatrization and inflammation rendered an accurate closure impossible.

Postoperatively drainage from the duodenostomy was minimal and the catheter was removed on the tenth day after surgery. No further drainage was observed and the patient was discharged on the fourteenth postoperative day. She was well on follow-up examination on September 26, 1951, 18 months after operation.

Comment: This is the only patient in the series in whom the duodenostomy was not an "end" duodenostomy.

Case 4. A 58 year old white man came to the Clinic in April 1950 complaining of pain in his epigastrium of about 2 years' duration. The pain had become more severe in the last 2 months and had failed to respond to medical treatment.

X-ray examination of the stomach revealed a large prepyloric ulcer.

On April 10, 1950 a subtotal gastric resection with vagotomy was performed for a chronic peptic ulcer of the pylorus penetrating into the pancreas. Catheter duodenostomy was considered desirable because of extensive induration and inflammation about the duodenum.

Postoperatively the duodenal drainage steadily decreased and the catheter was removed on the eighth day. The fistula rapidly closed and no further drainage was observed at the time of discharge on the tenth postoperative day. He was well on follow-up examination on March 10, 1952, nearly 2 years after operation.

Case 5. A 36 year old man came to the Clinic with a long history of intermittent ulcer distress and a draining fistula in the abdomen. In 1939 the patient had an emergency laparotomy for closure of a perforated duodenal ulcer. In 1946 a gastroenterostomy was performed, followed in 2 weeks by incision and drainage of a collection of pancreatic fluid. In 1948 another incision and drainage was performed.

Abdominal examination revealed a tender, movable epigastric mass. X-ray examination of the stomach disclosed a jejunal ulcer and questionable duodenal fistula.

On June 28, 1950 an operation was performed consisting of subtotal gastric resection with vagotomy, resection of the jejunum containing a jejunal ulcer with end-to-end anastomosis, catheter duodenostomy and feeding jejunostomy. The duodenostomy was performed because of induration and cicatrization from the duodenal fistula.

Subsequent duodenal drainage was slight but constant. On the sixth postoperative day the duodenal catheter was removed; the drainage persisted for 4 to 5 days, thereafter clearing completely, and the patient was discharged on the fifteenth postoperative day. Follow-up by letter in September 1951, 15 months after the operation, revealed the patient to be in good health.

Comment: Despite the existence of a duodenal fistula prior to operation, closure of the duodenostomy wound was prompt and complete after the catheter was withdrawn.

Case 6. The patient was a 64 year old male physician who complained of epigastric burning of 15 years' duration. In 1937 he had an operative repair of a perforated duodenal ulcer. Postoperatively he developed a fistula of duodenal nature which closed spontaneously in a few weeks. In 1941 the patient experienced hematemesis and melena. The patient had a posterior gastroenterostomy in 1949, followed by recurrent epigastric burning in 1950.

X-ray examination of the stomach revealed a gastric ulceration, which was interpreted as presumably malignant.

On August 23, 1950, a subtotal gastric resection utilizing the previous gastroenterostomy was performed for an extensive ulcerated lymphosarcoma of the stomach. Catheter duodenostomy was considered advisable because of the extension of the neoplasm to the pylorus and the presence of additional induration and scar from the old duodenal ulcer.

Postoperatively, drainage from the duodenostomy decreased progressively, although there was some drainage around the catheter as well. The catheter was removed on the fourteenth postoperative day. Intermittent drainage continued for a number of days, but the duodenostomy was closed at the time of discharge from the hospital after completion of a course of x-ray treatments. It reopened for a few days several months after the operation, but closed again spontaneously. At a subsequent follow-up in July 1951, 11 months after the operation, the patient was completely asymptomatic.

Case 7. A 50 year old white man came to the Clinic in September 1950 complaining of vague epigastric discomfort of 25 years' duration. He had experienced repeated attacks of this distress associated with vomiting in the previous 3 years. In 1946 he had an operation consisting of a gastroenterostomy followed in 6 months by an enteroanastomosis.

X-ray examination of the stomach revealed hypertrophic gastric rugae, a nonfunctioning gastroenterostomy, pyloric narrowing and a duodenal deformity.

On October 2, 1950 an operation was performed consisting of a gastric resection with resection of the gastroenterostomy, and vagotomy for penetrating duodenal ulcer. Catheter duodenostomy was advisable because of much cicatrization of the entire duodenal wall.

Postoperatively, the patient developed a transient obstruction of the efferent loop of the gastrojejunostomy as evidenced by persistent gastric retention and prolonged drainage from the duodenal catheter. By the twelfth postoperative day the duodenal drainage had steadily decreased and the catheter was removed on the twentieth day. No subsequent drainage was noted and the patient was discharged a week later. He was seen on October 9, 1951, one year after operation; his abdominal wounds were well healed but he had mild steatorrhea.

Case 8. The patient was a 53 year old housewife, who came to the Clinic in October 1950. She complained of a gradual onset of upper abdominal, postprandial distress and bloating of 4 years' duration.

Abdominal examination revealed a palpable, movable epigastric mass with some associated tenderness. X-ray examination of the stomach revealed an ulcerating lesion of the distal antrum.

On November 1, 1950 a subtotal gastric resection, catheter duodenostomy, and feeding jejunostomy were performed for scirrhous carcinoma. The catheter duodenostomy was carried out because of wide removal of the duodenum and extensive induration and edema.

Postoperatively, some bile drainage was noted around the duodenal catheter on the fifth day. This continued until the eighth day when the catheter was removed. Minimal duodenal drainage was observed for 3 to 4 days thereafter, but the fistula had closed before the patient was discharged on the fifteenth postoperative day. At follow-up examination in September 1951, 11 months after operation, the patient was asymptomatic.

Case 9. The patient was a 55 year old housewife who was admitted to the Clinic on January 26, 1951. She complained of intermittent epigastric distress dating back 4 to 5 years. For 2 to 3 days prior to admission the patient had experienced dizziness, followed by the passage of tarry stools and vomiting of blood. She was in shock on

admission, but improved temporarily with blood transfusions and other suitable measures. When it became evident that active bleeding was still occurring 36 hours after admission, she was taken to the operating room where a subtotal gastric resection, catheter duodenostomy and feeding jejunostomy for bleeding duodenal ulcer were performed. The catheter duodenostomy was considered advisable because of extensive fixation of the duodenum to the head of the pancreas.

Postoperatively the duodenal drainage decreased progressively, and the duodenal catheter was removed on the tenth day. The duodenostomy site became infected and drained slight amounts of semipurulent matter for about 3 months. This ultimately healed and the patient was well in February 1952, one year after the operation.

Case 10. The patient was a 47 year old man who complained of epigastric pain of 10 months' duration, and recent vomiting. There had been a 10 pound weight loss.

A movable epigastric mass was noted upon abdominal examination. X-ray examination of the stomach revealed a neoplasm of the stomach.

On July 19, 1951 a subtotal gastric resection, catheter duodenostomy and feeding jejunostomy were performed for carcinoma of the stomach extending into the duodenum. After consultation with the pathologist, a further resection of duodenum had been done to secure a wider margin. The duodenostomy was performed because there was little duodenum left proximal to the ampulla of Vater.

Postoperatively the patient made a satisfactory recovery. Some duodenal drainage was present, but progressively decreased. The catheter was removed on the tenth postoperative day. He was discharged 2 days later with no further drainage from the duodenal fistula. The patient was seen on January 31, 1952, 6 months after operation, at which time he was well.

Case 11. A 64 year old white man came to the Clinic complaining of intermittent epigastric distress of 3 years' duration, and weight loss of 45 pounds in less than one year.

X-ray examination of the stomach revealed prepyloric ulceration interpreted as presumably malignant.

On November 9, 1951 a subtotal gastric resection, catheter duodenostomy and feeding jejunostomy were performed for benign pyloric ulcer. The catheter duodenostomy was done because of a severe inflammatory reaction surrounding the duodenal stump.

Postoperatively the patient did well, but slight inflammation was observed around the enterostomy catheters. The duodenal drainage diminished steadily and the duodenal catheter was removed on the seventh postoperative day. No further drainage was noted and the patient was discharged 4 days later. On follow-up examination January 28, 1952, the duodenostomy temporarily opened up via a sinus tract from a wire suture. The suture was removed and, on subsequent examination in February 1952, 3 months after operation, the duodenostomy had completely healed.

Summary

Catheter duodenostomy is a valuable maneuver in patients where technical difficulties render a tight closure of the duodenal stump difficult or insecure. The technic of the procedure is described, and experiences with 11 patients detailed. There were no deaths and no serious complications in any of these patients.

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