A MODIFIED WHIPPLE OPERATION FOR CARCINOMA OF THE HEAD OF THE PANCREAS*

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SINCE the demonstration by Whipple, Parsons, and Mullins, in 1935, that ligation of the pancreatic duct could usually be tolerated in the course of partial pancreatectomy for carcinoma of the ampulla of Vater in man, renewed interest has been aroused in radical surgical approaches to the pancreas. This trend was strengthened by Whipple's report, in 1938, of successful extirpation of carcinoma of the head of the pancreas. Prior to 1941, procedures designed for extirpation of such lesions were in general performed in two stages. One such procedure was successfully carried out by Dr. John R. Paine at this clinic. The patient survived for three months after the second stage operation and died elsewhere of unknown cause, an autopsy not being obtained.

With the advent of vitamin K and more adequate use of blood and plasma transfusions, however, the trend is now toward a one-stage operation. In November, 1941, Trimble, Parsons, and Sherman reported a successful one-stage procedure, the technique being essentially the same as that now in use by Whipple. In this procedure, partial gastrectomy with an anterior Polya gastrojejunostomy was performed, the common bile duct being implanted into the jejunum just distal to the gastric stoma.

Upon review of the pertinent literature, several considerations become apparent with regard to the performance of a satisfactory operation. The first of these is the prevention of ascending cholangitis following anastomosis between the biliary and intestinal tracts, a complication of considerable frequency in the best of hands. Trautmann, Robbins, and Stewart showed in experimental studies in dogs that simple side-to-side anastomosis of bowel to gall bladder uniformly is followed by passage of intestinal content into the biliary tract. Wangensteen concluded that even though this occurs, the essential factor in preventing cholangitis and hepatitis is the prevention of obstruction at the stoma. Bachrach and Fogelson confirmed this in the case of choledochojejunostomy.

Various authors have described procedures intended to prevent reverse flow into the biliary tract. Kausch described a Y procedure somewhat similar to the Roux gastrojejunal anastomosis, and others have offered

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modifications, all, however, with short segments separating the biliary anastomosis from the main enteric stream.

A further consideration is the development of the simplest procedure possible, one with a minimum of anastomoses, etc., a factor demanded by the usual poor condition of these patients. Finally, leakage of pancreatic juice into tissues or suture lines must be prevented. (Verne C. Hunt has reported successful implantation of the pancreas into the end of the jejunum, and T. G. Orr has also had two successful cases.)

I have operated upon a case by a variant of these procedures which seems to overcome the difficulties outlined above. A wide stoma is assured by end-to-end cholecystojejunostomy; regurgitation into the biliary tract is minimized by use of a long jejunal segment separating the biliary from the gastric anastomosis. There are but two anastomoses, and pancreatic digestion is rendered unlikely by adequate use of drainage.

CASE REPORT

History.—H. V. J. (U. H. No. 715130), a man of 64, was admitted on the medical service Dec. 18, 1941, with a one-year history of vague digestive distress and a two-month history of gradually increasing painless jaundice with dark urine and acholic stools. He had lost twenty pounds in the preceding three months and over fifty pounds in the preceding two years. The remainder of the history was irrelevant, except for a story of dyspnea on exertion.

Examination revealed nothing outside normal limits except for jaundice and emaciation. The laboratory work showed hemoglobin 12 Gm. per 100 c.c. of blood. Serum bilirubin was 14.1 mg. per cent. The urine was normal except for bile pigments. Pulse was 60; blood pressure, 109/65; height, 74 inches; weight, 157 pounds clothed. Quantitative examination of the stool for urobilinogen showed passage of 0.7 mg. daily, indicative of complete biliary obstruction and, therefore, carcinomatous obstruction (Watson).

He was given a high vitamin, high protein diet including parenteral vitamin K preoperatively.

Operation.—On Jan. 2, 1942, with a weight of 139 pounds, the patient was transferred to the surgical service and taken to the operating room. The operation was started under cyclopropane, but the anesthetic was changed to ether and oxygen shortly because of the development of auricular fibrillation. Through a long transverse incision, one-third of the way from the umbilicus to the xyphoid, the abdomen was opened. A vertical extension was made upward in the right rectus muscle later in the procedure.

A small discrete tumor was found in the region of the head of the pancreas. It was placed rather high (cephalad) in the head of the pancreas. There was no evidence of spread of the tumor within the peritoneal cavity except for three small irregularities on the surface of the liver. Inasmuch as these irregularities could not be definitely considered to be carcinoma, and in any case did not seem to justify abandonment of all operative procedure, it was decided that radical one-stage resection of the head of the pancreas and duodenum should be performed. The lower end of the stomach was dissected free, and the pylorus was cut between clamps. The lateral avascular ligament of the duodenum was cut down as far as the mesocolon and the duodenum with the tumor attached to the internal margin was rotated forward. Dissection was carried down to the uncinate portion of the head of the pancreas, which was dissected free from the third portion of the duodenum. The

superior mesenteric artery and vein were identified and followed upward, and were found to pass very close to the left lateral margin of the tumor. Nevertheless, it was possible to cut across the head of the pancreas, sparing these vessels. The main duct was tied with silk of five-pound test. The common bile duct was tied with heavy silk and divided near the duodenum. The posterior capsule of the pancreas was sutured to the anterior with mattress sutures of five-pound test silk. At this point it became apparent that the circulation to the last part of the duodenum

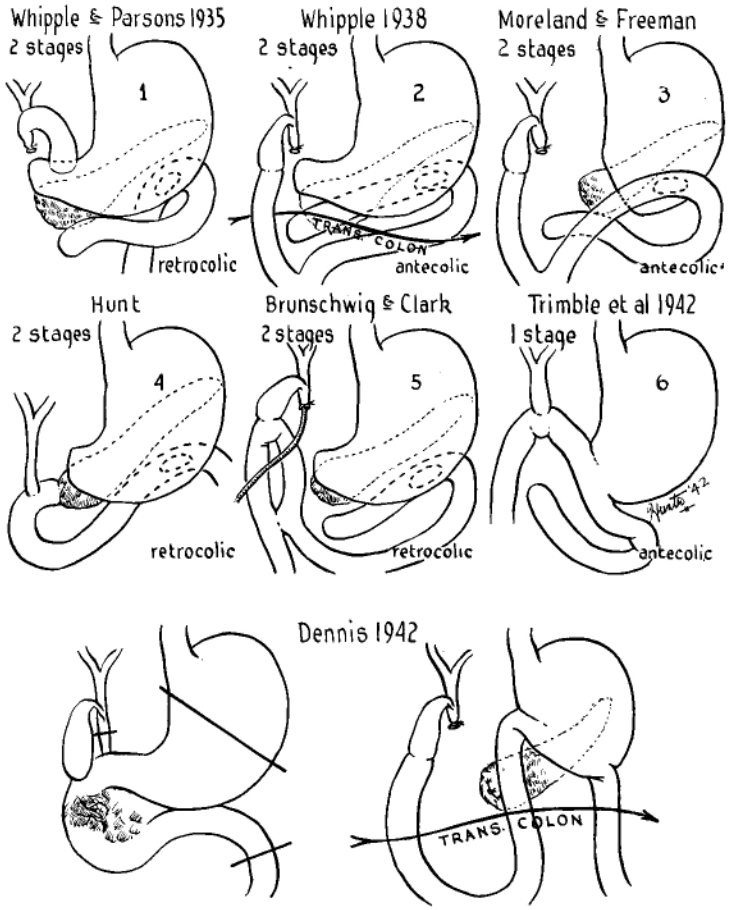

Fig. 1.—Outline diagrams of several operative procedures which have been employed for extirpation of carcinoma of either the ampulla of Vater or of the head of the pancreas.

and to the lowest third of the stomach was inadequate, and both were, therefore, resected, the lines of section crossing the stomach in the midportion, and the jejunum about eight inches below the ligament of Treitz. The gall bladder, which had been found tensely distended, was emptied without spillage by trocar, the remaining end of the jejunum was brought retrocolically through the channel formerly occupied by the duodenum, and an end-to-end cholecystojejunostomy was performed by a closed technique similar to that of Martzloff and Burget, with fine catgut internally and silk mattress sutures externally, a few grains of sulfathiazole being placed between the rows of sutures. Leaving a long (40 cm.) proximal loop, and implanting

a few grains of sulfathiazole between rows of sutures, a retrocolic Polya gastrojejunostomy was performed much as described by Wangensteen. It had been planned to do a Coffey type of anastomosis between the tail of the pancreas and the jejunum below the gastrojejunostomy, but the patient's condition was not satisfactory, inasmuch as he had been having fibrillations for some time and the blood pressure had fallen below 100 mm. Hg. A cigarette drain was brought down to the cut end of the pancreas after all large vessels in the neighborhood and also the ligated end of the common duct had been covered with omentum. The end of the rubber drain was sutured anteriorly and posteriorly to the cut end of the pancreas in such a fashion that any leakage from it would have to escape through the drain, and a tunnel of omentum was made with catgut sutures to surround the drain to a stab wound placed about 6 cm. below the midportion of the incision, a precaution to prevent drainage from reaching the line of closure. Approximately one gram of sulfathiazole was placed in the region of the cut surface of the pancreas. The incision was closed with interrupted five-pound test silk, with implantation of a few more grains of sulfathiazole. The patient received 1,500 c.c. of blood and 400 c.c. of plasma during the seven-hour procedure, and left the operating room in fair condition.

Postoperative Course.—Postoperatively the patient went into acidosis, and the blood sugar rose to 230 mg. per cent, a result attributed to manipulation of the pancreas. The daily administered 20 per cent dextrose solution (1,000 c.c. daily) was, therefore, accompanied by 60 units of insulin per liter the first two days, following which the insulin requirement rapidly disappeared. Immediately postoperatively the patient was digitalized rapidly, but continued to have auricular fibrillation for several days. On the third day bile stained fluid drained through the cigarette drain, and this persisted for thirteen days, the daily volume diminishing gradually from an original 200 c.c., and the bile content also decreasing. A small stitch abscess occurred at fourteen days, but healing occurred quickly on drainage. The cigarette drain was removed at fourteen days. A trial on pancreatic juice obtained from a canine pancreatic fistula prior to dismissal resulted in nausea. He was therefore placed on pancreatin* and polyvitamin capsules on dismissal twenty-one days after operation.

Following dismissal the patient gained ten pounds in eight weeks, and improved in general health and strength. On March 28, he had begun to lose weight and was observed to have bulky, fatty, foamy, strong smelling stools. He also complained of nausea on ingestion of sweet foods. For these reasons he was readmitted for study. A gastrointestinal roentgen study showed rapid emptying of the gastric pouch with no regurgitation of the contrast medium into the proximal jejunal loop. There has been no evidence of cholangitis and no overt evidence of recurrence at the present writing, three and one-half months postoperatively. Preliminary studies indicate absorption of only 65 per cent of ingested fat; further studies are being performed. The patient has ceased losing weight at 129 pounds, following institution of a special diet.†

CONCLUSION

An operative procedure for carcinoma of the head of the pancreas has proved successful in one case. It encompasses excision, also, of

*Eli Lilly and Company.

†After this paper had been submitted for publication, this patient returned with recurrence in the line of incision. Roentgen therapy has been employed, but he is losing ground rapidly at this time (June 24).

the lower half of the stomach and of the entire duodenum. To prevent subsequent cholangitis, internal biliary drainage with a *wide stoma* is accomplished by end-to-end cholecystojejunostomy, and regurgitation into the biliary system is rendered minimal or absent (as shown by roentgen study) by the use of a *long loop* between this anastomosis and the posterior Polya gastroenterostomy.

Pancreatic steatorrhea has followed exclusion of pancreatic secretion from the intestinal tract. Because of this occurrence in this case and in some cases reported elsewhere, consideration of reimplantion of the pancreatic duct into the bowel in such cases is being entertained both here and elsewhere.

ADDENDUM

After this paper had been prepared, an additional case of carcinoma of the head of the pancreas in a man of 67 has been subjected to resection of the lesion. Difficulties were encountered because of very low choledochocystic junction, which was involved in the lesion, and because of arterial anomalies consisting of absence of the celiac axis and origin of the hepatic artery from the superior mesenteric artery, the anomalous hepatic artery traversing the head of the pancreas. Considerable blood loss occurred following removal of the lesion, and large transfusions were necessary before satisfactory repair had been accomplished to the anomalous hepatic artery, the portal vein, the splenic vein, and an anomalous vessel springing from the left gastric to the left lobe of the liver. The procedure was completed with choledocho-enterostomy to the closed end of the jejunum brought through the mesocolon and Polya gastroenterostomy after hemigastrectomy. The patient, however, died shortly postoperatively. Autopsy showed a clean, dry operative field and massive pulmonary edema. Further arterial anomalies were also present.

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