One-layer pancreaticojejunostomy for prevention of pancreatic fistulae

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BACKGROUND: **Anastomotic leakage at the pancreaticojejunostomy remains a common and dreaded complication after pancreaticoduodenectomy. This study was to introduce a method for lowering the mortality, morbidity, and other postoperative complications after pancreaticoduodenectomy.**

METHODS: **From January 1991 to December 2001, twenty-six patients were treated using one-layer pancreaticojejunostomy. The mean age of these patients was 52.3 years. Some of these patients were complicated by hypoproteinemia, anemia and jaundice. All patients were subjected to pancreaticoduodenectomy, reconstruction of the digestive tract by Child's method, and one-layer or Braun's anastomosis after pancreaticojejunostomy, choledochojejunostomy, and gastrojejunostomy.**

RESULT: **No death and pancreatic fistula were observed after operation.**

CONCLUSION: **One-layer pancreaticojejunostomy is simple and safe.**

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KEY WORDS: **one-layer, pancreaticojejunostomy; pancreaticoduodenectomy**

Introduction

Pancreaticoduodenectomy is suitable to benign and malignant diseases of the periampullary region and the head of the pancreas. Previous reports have shown a high postoperative morbidity and mortality as well as a disappointing long-term survival rate.[1-9] Although current operation mortality and morbidity of pancreaticoduodenectomy have been reduced, surgeons are still in a dilemma when they try to find a better treatment for their patients with obstructive jaundice caused by tumors of the periampullary region and the head of the pancreas in particular.[10-15] The troublesome complications of pancreaticoduodenectomy include partial disruption of pancreaticoenteric anastomosis and subsequent leakage of pancreatic secretions; the latter is the main cause of death shortly after pancreaticoduodenectomy.[16-20] Improvement of operative techniques (techniques of pancreaticoenteric anastomosis) and perioperative care have reduced operative morbidity and mortality of pancreaticoduodenectomy in recent years, but pancreatic fistulae still occur. Gameron et al[21] reported that of 145 patients treated with pancreaticoduodenectomy, 28 (19%) suffered pancreatic fistula. Zhu[22] reviewed the literature with a conclusion that the rates of pancreatic fistula after pancreatic and jejunal mucosa anastomosis and anastomosis of the jejunum to the intussuscepted pancreatic stump are 7%-18% and 13%-36%, respectively, and that the postoperative mortality relevant to fistula is 7.9%. We modified pancreaticoduodenectomy by using one-layer pancreaticojejunostomy,[23] and have used it in the treatment of a total of 26 patients since 1991.

Methods

Patients

From January 1991 through December 2001, eighty-seven patients were treated using pancreaticoduodenectomy at Zibo Municipal Central Hospital, Binzhou Medical College, Zibo, China. One-layer pancreaticojejunostomy was applied to 26 patients, 8 women and 18 men, aged from 29 to 74 years (mean 52.3 years).

Clinical manifestations and associated diseases

Major clinical symptoms included pain and discomfort in the abdomen (15 patients), jaundice (9) and emaciation and asthenia (1). One patient was found on physical examination no symptoms at all. Laboratory examination revealed serum billirubin, 20.52-513 μmol/L; plasma proteins, 49-76 g/L; autologous protein, 29-45 g/L; and hematoglobin, 76-130 g/L. The associated diseases included coronary cardiopathy, chronic nephritis, and diabetes.

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Lesions and management

Tumors were localized in the pancreatic head (15 patients), the distal common bile duct (7), and the duodenal papilla (4). The diameter of the tumors varied from 1.5 cm to 4 cm. All the patients were treated with pancreaticoduodenectomy. The digestive tract was reconstructed by Child's method, and one-layer anastomosis was used.

Operative method

Anastomosis of the pancreas and jejunum is the most crucial step in pancreaticoduodenectomy. Detailed procedures for this anastomosis in the 26 patients are described below. After pancreaticoduodenectomy, the cutting edge of the pancreas was dissociated for 1 cm to 1.5 cm. As soon as the main pancreatic duct was identified, a tube with the same diameter was then inserted into the duct for 3 cm to 5 cm, and immobilized by two sutures at the two sides of the main duct. The tube kept the pancreatic duct open and unimpeded. The distal end of the tube must transcend the site of choledochojejunostomy, and must not be twisted in the intestinal cavity. The cutting edge of the pancreas and the jejunum was inosculated by one-layer end-to-end anastomosis. The distance between the two sutures was 0.3 cm, and the distance between the two pinholes (insert the jejunum out of the pancreas) was 0.5 cm. For optimum exposure, all the sutures were placed prior to tying and cutting of all the distal sutures after lying down. The sutures were lain down in the jejunum cavity. The anastomosis of the anterior wall was performed exactly in the reverse order. The jejunal limb was sutured to the pancreas stump. The strength of the suture must be proper to avoid laceration of the pancreas. An end-to-side choledochojejunostomy was performed with size 4 silk suture 15 cm away from the site of pancreaticojejunostomy. No T-tube was placed. An anterior gastrojejunostomy was carried out 4 cm away from the site of pancreaticojejunostomy. To prevent potential reflux cholangitis, Braun's anastomosis was performed between the two jejunums of gastrojejunostomy. One-layer suture was applied to all anastomoses. After closing the anterior layer of Braun's anastomosis, the abdominal cavity was rinsed. A drainage tube was placed in the posterior site of pancreaticojejunostomy and choledochojejunostomy was brought out through the abdominal wall. It can make valuable contributions to prevent dropsy under the liver.[24]

Postoperative care

Somatostatin was prescribed for 18 patients with a dose of 0.1 mg for intramuscular injection 2-3 times a day. Twelve patients were given no special treatment. The volume of abdominal cavity drainage was 50-100 ml on the first day after operation, and was gradually reduced to 20-30 ml after 2-3 days. Only one patient had a drainage of 50 ml on the 6th day after operation. When the drainage was less than 10 ml for 3 continuous days, the tube then was removed 7-10 days after operation on average.

Results

All the patients were verified pathologically. Twenty-five patients sustained periampullary carcinoma (23 with adenocarcinoma and 2 with adenocytocarcinoma), and one patient, neural fibroma. All the patients were treated with one-layer pancreaticojejunostomy without mortality and fistula during hospitalization. Only one patient had wound infection. One week after operation, ultrasonography showed no hydrops under the liver or around the pancreas in these patients. Of the 26 patients, 23 were followed up and 3 lost. In this group, 9 patients survived for an average of 17.8 months, 14 patients died after survival of an average of 30.2 months (the longest 73 months), and among them 3 died of chronic renal failure, lung infection and acute coronary infraction one year after operation.

Discussion

At present, pancreaticoduodenectomy as the only potentially curative therapy for tumors of the periampullary region will not induce pancreatic insufficiency.[25-29] But this operation must remove several vital organs that are connected by a number of vital tissues, making it one of the most dangerous abdominal operations. Thus, it is required that those who perform this operation must acquire adequate anatomical knowledge and technical skills in addition to expertise in assessing the pros and cons of pancreaticoduodenectomy for each individual patient.[30-31] Unfortunately, it is not easy to attain this goal in the period of surgical residency. We recommend that pancreaticoduodenectomy be performed by experienced surgeons.

Pancreatic stump is regularly severed. For good blood circulation, the stump must not be dissociated too long. In our series, the stump was dissociated mostly for 1-1.5 cm (1.5 cm in 18 patients, 1 cm in 7, and 2 cm in 1). Cross-section must not be cut as a fish mouth because of its poor blood circulation. When suturing or knotting, it is easy to lacerate the tissue, leading to pancreatic leakage. Cross-sectional bleeding can be stopped by suture or electric coagulation. Any discernable bleeding must not remain in sight.

The main pancreatic duct should not be dissected regularly. A drainage tube with a diameter equal to that of the duct is inserted into the duct for 3 cm to 5 cm. Two-3 small side-foramina can be scissored at the head of the tube, which should be immobilized by two su-

tures at each side of the duct after making pancreatic duct open and unimpeded. The distal end of the tube must transcend the site of choledochojejunostomy, while making sure that the tube is not twisted in the intestinal cavity.

The operator of pancreaticoduodenectomy may have a good feeling of safety in using two-layer suture since it has one more protection than one-layer suture. If the first suture does not work, the second is believed to do the job.[32] But the fact is that, if the first layer does not work, leakage will occur between the two layers and result in increased surface tension. Because the second layer consists of serosa, the flexibility and resistibility of the second layer are less than those of the first layer. So, the second layer will not work well if the first fails. The one-layer suture requires better skills to prevent pancreatic leakage. The two-layer suture can extrude the jejunum to the intussuscepted pancreatic stump and result in poor blood circulation when the stump is too large or the cavity of the jejunum is too small. The one-layer suture is less stimulating to the tissue, but its resistibility is no less than that of the two-layer suture.

This method is applicable to any patients who will undergo pancreaticoduodenectomy, and reconstruction of the digestive tract by Child's method. We once treated a patient with chronic pancreatitis, who had a small stump of the jejunum, showing strong resistance of the jejunal wall and poor blood circulation. To improve the blood circulation, the sutures were removed without further management. We suggest that this technique is good for those who have a large pancreatic stump.

The conditions of patients with pancreatic cancer are poor.[33,34] Pancreaticoduodenectomy may cause serious damage to the body and induce heavy blood loss. Hence intensive care should stress on better nutrition, correction of hypoproteinemia, control of water-electrolyte balance, acid-base metabolism, and blood coagulation before operation, and on drainage monitoring and injection of somatostatin after operation so as to prevent pancreatic leakage.

In conclusion, one-layer pancreaticojejunostomy is suitable for those patients requiring pancreaticojejunostomy because of its safety, simplicity and adaptability to all types of pancreatic stumps. The rate of pancreatic leakage is comparable to that of any other method. But, large clinical trials are needed to verify the preliminary results.

Competing interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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