To the Editor: Distal pancreatectomy is one of the most commonly performed procedures for tumors involving the neck and body of the pancreas. Left-sided pancreatic resection reduces pancreatic function and is associated with an increased incidence of diabetes mellitus. Severe exocrine insufficiency has been reported more often after left-sided pancreatic resection than after the following standard pancreateoduodenectomy. Tumor enucleation and middle segmental pancreatic resection (MSPR) were suggested by Beger et al.,[1] especially for pancreatic benign tumors located in the neck and body of the pancreas. However, the high rate (>30%) of pancreatic fistula formation with pancreaticojejunal anastomosis has prevented widespread use of MSPR.[1,2] So far, no better procedures have been described for pancreatic reconstruction. In this case series, we applied a new reconstructive technique, pancreaticojejunal bridge stent internal drainage (PJBSID) after MSPR and studied the postoperative outcomes.

This study included patients with benign or borderline pancreatic tumors of the body and neck of the pancreas who underwent MSPR with PJBSID between June 2009 and June 2017. All patients voluntarily gave written informed consent before surgery. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Shengjing Hospital of China Medical University. The pancreatic mass was evaluated preoperatively in all patients through contrast-enhanced computed tomography.

MSPR was performed as per the standard technique described by Warshaw et al.[3] After MSPR, the distal and proximal resection margins were confirmed to be free of tumor based on pathologic examination of frozen sections. The pancreatic duct in the proximal resection margin was sutured using 5-0 Prolene sutures in a U-shaped pattern. One end of the silicon tube was inserted into the main pancreatic duct in the tail of the pancreas and fixed at 6–8 sites to allow the tube to remain in situ as long as possible. Later, it may remain in situ indefinitely or be passed rectally. The diameter of the silicon tube varied from 3 to 5 mm, depending on the diameter of the main pancreatic duct. The other end of the silicon tube was inserted into the adjacent jejunum with tunneling and embedded suturing [Figure 1]. The peritoneal drainage tube was placed in the pancreatic bed, and its patency was maintained by slow infusion with normal saline during the 2–3-week postoperative period depending on the characteristics and amylase levels of the drainage fluid.

Prophylactic antibiotics were given for 3 days postoperatively, after which they were stopped if the patient did not develop fever or leukocytosis. Somatostatin was given to all patients for 1 week. An oral diet was started as soon as the bowels began functioning. Drain fluid amylase levels were measured on postoperative days 1, 3, 5, and 7. Drains were removed only if the output was clear with normal amylase values. In case of turbid drain output, the drain tubes were withdrawn gradually and removed after the output became clear.

PJBSID was performed following MSPR for tumors of the neck and body of the pancreas in 15 patients. Among the 15 patients,

Figure 1: Intraoperative picture and sketch of PJBSID. (a) Middle segmental pancreatic resection with a silicon tube used as a bridge between the pancreatic duct and jejunum, which is PJBSID. (b) Sketch of middle segmental pancreatic resection with PJBSID. PJBSID: Pancreaticojejunal bridge stent internal drainage.

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Received: 13-02-2018 Edited by: Yin Chen
How to cite this article: Sun DX, Gao F, Song JS, Liu N, Zhu FF, Du Y, Bu XM, Tan XD, Dai XW. Pancreaticojejunal Bridge Stent Internal Drainage as a Safe Reconstruction Technique after Middle Segmental Pancreatic Resection. Chin Med J 2018;131:1367-8.
12 who had non-malignant tumors (8 cases of pancreatic cystadenoma and 4 cases of pancreatic endocrine tumors) underwent PJBSID; for the remaining three patients with borderline tumors (solid pseudopapillary neoplasm), pathologic examination of frozen sections of the distal and proximal resection margins was performed to ensure that the resection margins were negative. The surgery was completed without complication in all cases. One patient had grade A pancreatic fistula as per the International Study Group of Pancreatic Fistula definition. We kept the patient in the hospital to flush the drainage tube until the drain fluid amylase levels were in the normal range and the drainage fluid became clear. The incidence of pancreatic fistula was 6.7%. As compared, the pancreatic fistula rate was 31.2% in the patients undergoing MSPR and pancreatojejunostomy in the previous report. Another patient had diabetes preoperatively and received insulin to control blood glucose postoperatively at a dose similar to the preoperative dose. The patients experienced steatorrhea.

The pancreas is one of the most important organs in humans, fulfilling both exocrine and endocrine functions. The pancreatic secretions contain several digestive enzymes that are crucial to food digestion. The diversity of pancreatic endocrine functions is attributed to the pancreatic islets, which are located throughout the pancreas, especially the body and tail. Thus, preservation of the normal body and tail of the pancreas is crucial to prevent postoperative exocrine and endocrine dysfunctions. However, pancreatojejunostomy with a remnant pancreatic stump is associated with a high rate of pancreatic fistula formation. To reduce the occurrence of pancreatic fistula, various techniques have been described such as duct ligation, pancreategastrostomy, and others, but none has been widely adopted.

PJBSID was first applied by us in a patient with complete disruption of pancreaticojejunal anastomosis after pancreaticoduodenectomy in June 2006, and this use of internal drainage through the main pancreatic duct led to the patient having an unexpectedly smooth postoperative course. No patients experienced steatorrhea.

In PJBSID, the silicon tube drains all the pancreatic secretions from the remnant pancreas into the jejunum. Hence, appropriate fixation of the silicone tube to the pancreatic duct is crucial to prevent postoperative pancreatic leakage. Furthermore, it is important for the silicon tube to stay in position for at least 4–6 weeks for the development of a fistulous tract between the pancreatic duct and the jejunum. Both of these objectives were achieved by our technique, leading to a low incidence of postoperative pancreatic fistula. Theoretically, blockage of the silicon tube, retrograde infection, and development of acute pancreatitis are possible and could lead to pancreatic leakage. However, none of these complications were observed in this study. Minor leakage of pancreatic secretions from the cut surface of the pancreatic remnant was prevented by interrupted or U-shaped suturing of the distal stump.

In summary, PJBSID allows preservation of the pancreas with drainage of pancreatic secretions into the small intestine using a new, easy, safe, and reliable technique. Studies with a larger sample size and longer follow-up are required to confirm the short- and long-term efficacy of PJBSID in MSPR.

Declarations of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients' guardians have given their consent for their images and other clinical information to be reported in the journal. The patients' guardians understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

This study was supported by a grant from National Natural Science Foundation of China (No. 81301836).

Conflicts of interest

There are no conflicts of interest.

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