Transpancreatic Mattress Suture with Vicryl Mesh Around the Stump During Distal Pancreatectomy: A Novel Technique for Preventing Postoperative Pancreatic Fistula

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Distal pancreatectomy (DP) is performed for benign and malignant lesions of the distal pancreas. Despite advances in surgical techniques and perioperative care, the morbidity rate remains high in patients undergoing DP, ranging from 11.4% to 60.9%.[1-5] Postoperative pancreatic fistula (POPF) is the most common and clinically relevant surgical complication because it is often associated with a high incidence of intra-abdominal abscess, hemorrhage, sepsis, and prolonged hospital stay. To reduce the rate of POPF after DP, various surgical techniques for managing the pancreatic remnant have been reported. These include handsewn suture closure, transection and closure using various stapling devices, a combination of staple closure and reinforcement of the stump with suture or seromuscular patch, falciform patch and the use of fibrin sealants, and pancreatic enteric anastomosis.[1-7] However, no optimal techniques for reproducibly preventing POPF after DP have been established and no one technique has been unequivocally identified as consistently superior to the others.

Here, we report a novel surgical technique using transpancreatic mattress suture with Vicryl mesh (polyglactin; Ethicon, Inc). We present the perioperative results of our initial series for preventing POPF after DP.

METHODS

Patients

Distal pancreatectomy was performed on a total of 38 patients at the Hospital of the Kindai University Faculty of Medicine between September 2014 and December 2015. Of these, 26 consecutive patients indicated for open DP were enrolled in this study. The other 12 patients underwent laparoscopic DP and were excluded. Data were collected prospectively and clinicopathologic and surgical outcomes were analyzed retrospectively. The surgery was carried out by Dr Yoshifumi Takeyama or Dr Ippei Matsumoto, who had performed a minimum of 200 pancreatic operations previously. Patients provided written informed consent before treatment according to the rules and regulations of our institution.

Surgical procedure

The open approach was most commonly taken via an upper midline incision with self-retaining retractor. Lymphadenectomy was routinely performed in patients with malignant neoplasm. The majority of dissections were performed with electrocautery or using a vessel-sealing device. Pancreatic parenchymal division was performed with a scalpel. After identifying the main pancreatic duct on the cut surface of the pancreas, direct double ligations were performed with 4-0 polydioxanone (Ethicon) (Fig. 1). Vicryl mesh (woven type) was cut to form a strip 1 cm wide. The pancreatic stump was wrapped with this strip of mesh. A transpancreatic mattress suture with the strip of mesh was made using a 3-0 monofilament polypropylene thread with double armed 1/8 circle needles (Asflex, Crownjun Kono Co., Ltd). The suture was passed from the dorsal to the ventral surface at a point 5 mm cranial from the cut end to straddle the main pancreatic duct. Two pancreas-transfixing sutures with the strip of mesh were then made at the same points of the mattress suture and ligated at the higher and lower ends of the pancreatic stump after all 3 sutures were completed (Fig. 2A, B). Finally, the mattress suture was ligated to accomplish pancreatic stump closure (Fig. 3). Abdominal drains were placed against the left subdiaphragm and the stump of the remnant pancreas (Video; available online).

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Abbreviations and Acronyms

DP = distal pancreatectomy
ISGPF = International Study Group of Pancreatic Fistula
POD = postoperative day
POPF = postoperative pancreatic fistula

Definition of postoperative pancreatic fistula and postoperative complications

Postoperative pancreatic fistula was defined by the classification system of the International Study Group on Pancreatic Fistula (ISGPF) as an amylase level in the fluid collected on postoperative day (POD) 3 that is >3-fold the serum amylase level.[8] Postoperative pancreatic fistula was assessed at 3 grades—A, B, or C—according to the ISGPF clinical criteria. The amylase levels of drainage fluid on PODs 1, 3, and 5 were measured in all patients if the drainage tube was persistent. Other postoperative complications were evaluated by means of a modified Clavien grading system.[9] The diameter of the main pancreatic duct and thickness of the pancreas at resection site were estimated and measured by preoperative multidetector row CT with 1-mm thickness based on the distance form the left edge of the portal vein measured intraoperatively.

RESULTS

Twenty-four of the 26 patients who underwent open DP using the novel method described here could be included in this study. Two patients were excluded because the cut lines of the pancreas were at the right sides of the portal vein and it was too difficult to wrap the mesh around the pancreatic stump. Patient characteristics and operative data are shown in Table 1. The patients were 16 men and 8 women with a median age of 66 years (range 30 to 86 years) with pathologic diagnoses of pancreatic cancer (n = 12), chronic pancreatitis (n = 7), cystic neoplasm (n = 3), and other (n = 2). Distal pancreatectomy with splenectomy was performed in 21 patients, spleen-preserving DP in 2, and DP with celiac axis resection in the remaining patient. Three patients underwent concomitant resection of other organs (colon, n = 3; stomach, jejunum, left adrenal gland, and, left kidney, n = 1). Twenty of 24 (83%) patients had a soft pancreas. Median diameter of the main pancreatic duct and thickness of the pancreas at the cut line were 2.0 mm (range 1.0 to 6.0 mm) and 14.0 mm (range 6.0 to 25.0 mm), respectively. Median operation time and estimated blood loss were 174 minutes (range 91 to 384 minutes) and 571 mL (range 70 to 3,149 mL), respectively.

Although 16 patients (67%) developed POPF grade A according to the ISGPF, no clinically relevant POPF grade B or C was observed (Table 2). Median amylase levels of drainage fluid on PODs 1 and 3, duration of drainage, and postoperative hospital stay were 2,919 U/L, 1,109 U/L, 4 days, and 15 days, respectively. Ten patients were removed their drainage tube on POD 3 or 4. A median amylase level of drainage fluid on POD 5 was 465.0 U/L, with a range of 30.0 to 3,418 U/L (n = 14). Overall morbidity (Clavien classification grade II or higher) was observed in 5 (21%) patients, and there was no mortality. Three patients developed non-POPF-related intra-abdominal abscess. An 86-year-old female with cystic neoplasm of the pancreas underwent DP. The drainage tube was removed on POD 3 with amylase level of drainage fluid of 71 U/L. She had fever on POD 13 and CT scan revealed intra-abdominal fluid collection of 3 cm × 2 cm. She required antibiotics administration and endoscopic ultrasonography-guided drainage. A 65-year-old man with advanced pancreatic cancer underwent DP with combined resection of celiac axis, partial stomach, partial jejunum, left adrenal gland, and left kidney after preoperative chemoradiation. The amylase level of drainage fluid on POD 3 was 1,109 U/L. The WBC and C-reactive protein were increased and CT scan revealed fluid collection in the left subphrenic space on POD 9. A 61-year-old man with endocrine pancreatic tumor underwent DP. The amylase level of drainage fluid on POD 3 was 445 U/L. After removal of the drainage tube on POD 4, the WBC and C-reactive protein were increased and CT scan revealed intra-abdominal fluid collection with 3-cm diameter on POD 14. Both patients recovered with antibiotics administration. One patient required readmission and transient transabdominal

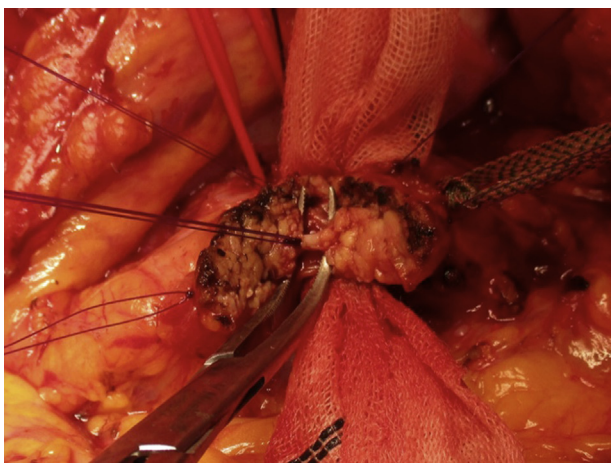

Figure 1. After identifying the main pancreatic duct on the cut surface, direct double ligations were performed.