



Following Up about the Change of Invaginated Pancreas in Stomach - 5 Cases of the Invagination Method for the Prevention of Pancreatic Fistula after Distal Pancreatectomy

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Abstract

No report about the appearances of invaginated pancreatic stump in the stomach has found. Five cases of distal pancreatectomy with our new technique, invagination of pancreatic stump into stomach to prevent Pancreatic Fistula (PF) were performed. We could follow up the stump in stomach with gastrofiberscope till one year later. One week after operation, massive stump could be admitted in the stomach, however, after three months, only very small stump could be seen, and after one year, we could find only scar in the posterior wall. About the results of our procedure, although a grade A PF was occurred, all of the patients were discharged on foot within the eleventh postoperative day. Our technique could be a suitable method for patients with a pancreatic body and tail tumor.

Keywords: Distal pancreatectomy; Pancreatic fistula; Invagination method; Pancreatic stump; Pancreatic tumor; Drain amylase

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Introduction

Distal pancreatectomy was first performed by Billroth in 1884 [1]. Since then, a lot of researchers have tried to perform this operation successfully with reducing the high morbidity and mortality rates [2-4]. However, unfortunately, they had not realized it, and some surgeons had concluded that the operation should be abandoned [5]. Furthermore, pancreatic fistula causes various complications such as abscess, hemorrhage, sepsis [6-9], and delayed gastric emptying [10], and these may result in considerable health care expenditures [11]. To prevent these complications, various methods have been reported that include a standard hand-sewn suture after main pancreatic duct ligation [12], staple closure [13], sealing with glue [14], use of a seromuscular patch [15], or pancreaticoenteric anastomosis [16]. However, to date, none of them have become a standard procedure. Here, we report our 5 consecutive cases of the new procedure [17], invaginating the pancreatic stump into the stomach after distal pancreatectomy with an excellent result. In this study, we also report the change of stump appearances in the stomach.

Methods

Patients

Between April 2012 and August 2015, 5 patients underwent distal pancreatectomy using our new procedure [17] invaginating the pancreatic stump into the stomach at the Department of Surgery of Misugikai Otokoyama Hospital in Kyoto. The clinical data including patient demographics, surgical procedure, perioperative detail, and short-term outcomes were collected prospectively.

Surgical technique

Handling of the pancreatic stump is accomplished with a pancreaticogastrostomy using the invagination method [17]. First, cutting line is decided according to the edge of tumor (Figure 1a). The pancreatic parenchyma transection is performed with GIA™ (Covidien Co. Ltd.). An incision, about 80 percent of the width of the residual pancreatic stump, in the posterior gastric wall is made for the invagination (Figure 1b). A row of interrupted 3-0 absorbable monofilament sutures is placed between the gastric seromuscular layer and the pancreatic parenchyma (Figure

Table 1: Perioperative results of distal pancreatectomy with the invagination method.

	Sex	Age	Disease (y.o.)	op. time (min)	blood loss(ml)	Drain amy. (3POD UI/L)	Hosp. stay (days)
Case 1	F	50	panc.tail cancer	211	162	190	9 (9)
Case 2	F	50	panc.tail cancer	239	385	657	19 (11)
Case 3	F	66	panc.tail cyst	224	150	1039	16 (11)
Case 4	F	65	panc.tail cyst	424	1510	40	25 (13)
Case 5 (emergency)	M	69	T-colon ca panc.tail invasion	184	220	272	28 (10)

Mean hospital stay 19.4 (10.8)

1c). No stenting is performed. Finally, a closed drainage tube (soft pleated drain, 24Fr: Sumitomo Bekuraido, Tokyo, Japan) in closed proximity to the pancreaticogastrostomy is positioned through the small omentum during the operation.

Postoperative management

The closed drainage tube was kept remaining in place for more than 3 operative days. Amylase levels measured in the exudative fluid on day 1 and 3 were used to precisely diagnose of a pancreatic fistula. The normal range of serum amylase levels at our hospitals is 10 IU/L to 110 IU/L. When the amylase levels of the exudative fluid were less than 330 IU/L and the fluid was clear and serous on the third operative day, the drains were removed. If the amylase levels were higher than 330 IU/L or the exudative fluid was bloody or dirty, the drain were removed after the amylase level decreased to less than 330 IU/L and the fluid improved to clear and serous. Patients were allowed oral intake on the fourth post operative day. We decide the day when the patient can be discharged without any problems, however, in many cases, the day when the patients hope to be discharged is not coincident. In those cases, we chose the day hoped by patient as the day of discharge.

Definition of postoperative complications

A pancreatic fistula was defined and classified according to the International Study Group on Pancreatic Fistula (ISGPF) [18]. Delayed Gastric Emptying (DGE) was defined and classified according to the definition by the International Study Group on Pancreatic Fistula (ISGPF) [10]. Postoperative complications were classified according to the Clavien-Dindo Classification of Surgical Complications [19]: The morbidity rate was defined as incidences of grade III and higher complications.

Results

The patients were 1 man and 4 women with a mean age of 60 years (range, 50 y to 69 y). The pathological findings indicated for distal pancreatectomy included 2 invasive ductal adenocarcinoma, 2

pancreatic cysts suspected of IPMN, and one advanced transversocolon cancer invasion to pancreatic tail. The concomitant splenectomies were performed in all 5 cases. All cases were performed with open surgery of abdomen. The perioperative data are listed in Table 1. The median surgical time was 256 min (range, 184 min to 424 min.) with a median intraoperative blood loss of 346 mL (range. 150 mL to 1,510 mL). None of the patients received red blood cell transfusions. Median amylase content in drainage fluid from all patients on the first and third postoperative day were 721 IU/L (range: 151 IU/L to 2533 IU/L) and 439 IU/L (range: 40 IU/L to 1039 IU/L), respectively. Drainage tubes of all 5 patients were removed on postoperative day 3. None of the patients in this study required reinsertion of a percutaneous drain or a surgical drain. According to the ISGPF definition [10], post operative pancreatic fistulae were observed in 2 patients of 5 cases (40%). However, both 2 fistulae were classified as grade A, and therefore not associated with any adverse clinical outcomes. Grade B or C pancreatic fistulae, which were clinically relevant complication, did not develop (0%). DGE developed in no patient (0%) who required reinsertion of the nasogastric tube. No patient experienced grade III and higher complications (morbidity, 0%) according to the Clavien-Dindo classification [19,20]. The postoperative mortality was nil. The median postoperative hospital stay was 11 days (range, 9 d to 13 d) (Table 1). We could follow up the stump in stomach with gastrofiberscope till one year later. One week after operation, massive stump could be admitted in the stomach, however, after three months, only very small stump could be seen, and after one year, we could find only scar in the posterior wall.

Discussion

Distal pancreatectomy was first performed by Billroth in 1884 [1]. Since then, a lot of researchers have tried to perform this operation successfully with reducing the high morbidity and mortality rates [2-4]. However, unfortunately, they had not realized it, and some surgeons had concluded that the operation should be abandoned [5]. Furthermore, pancreatic fistula causes various complications



Figure 1: Intraoperative findings a) to confirm the location of tumor and to decide the resection line. b) to measure the incision length. c) to invaginate the pancreatic stump into the stomach.

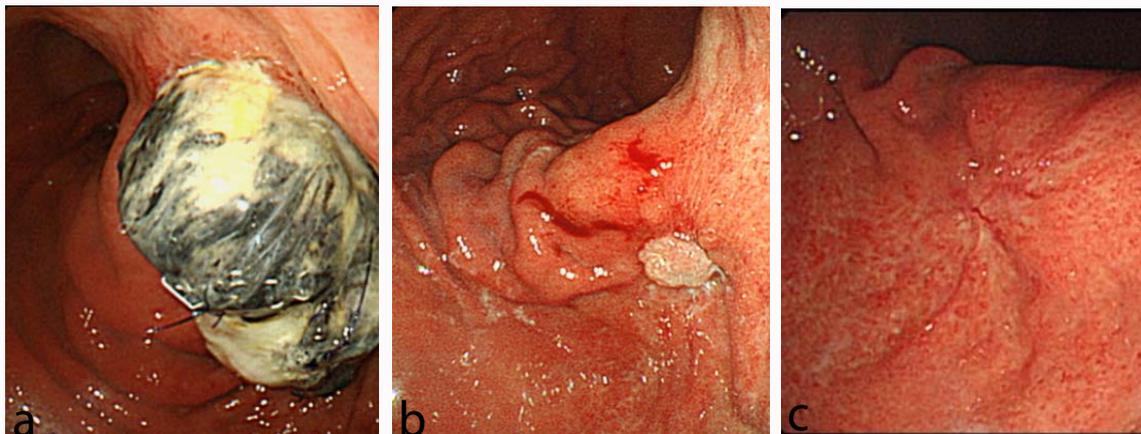


Figure 2: The change of the pancreatic stump in the stomach. a) After one-week, massive stump can be seen in the stomach. b) after 3-month, stump looks very small, c) after one year, we cannot admit the stump at all.

such as abscess, hemorrhage, sepsis [6-9], and delayed gastric emptying [10], and these may result in considerable health care expenditures [11]. To prevent these complications, various methods have been reported that include a standard hand-sewn suture after main pancreatic duct ligation [12], staple closure [13], sealing with glue [14], use of a seromuscular patch [15], or pancreatoenteric anastomosis [16]. However, to date, none of them have become a standard procedure. Sudo reported 21 cases performed the distal pancreatectomy with duct-to-mucosa pancreaticogastrostomy for preventing postoperative pancreatic fistula [20]. Their method led to no grade B and C pancreatic fistula judged with ISGPS criteria. In their report, they stated two potential factors promoting development of pancreatic fistula after distal pancreatectomy. One is extravasation of pancreatic juice from small branches of the pancreatic duct at the cut surface. These small ducts cannot all be identified and ligated because of their very small diameters. Opening of the smaller pancreatic duct branches on the cut surface has been considered the primary cause of pancreatic fistula development after distal pancreatectomy. The other is the increase in pancreatic ductal pressure associated with increased resistance to outflow of pancreatic juice toward the duodenum owing to contraction of the sphincter of Oddi. Variable closure techniques of the pancreatic stump, including hand-sewn, staples, sealing with fibrin glue, or covering methods, cannot completely seal the small ductal branches. The ligation of the main duct promotes a pressure gradient between the pancreatic duct and duodenum during contraction of the sphincter Oddi, which may lead to pancreatic fistula development from the ductal branches. Therefore, they perform the preoperative endoscopic stenting and intraoperative stenting for ductal decompression. Performing duct-to-mucosa pancreaticogastrostomy with an internal stenting tube can obviate both potential factors for fistula occurrence, promoting decompression of the main pancreatic duct and covering the small ductal branches by the gastric submucosal layer. Recently, a few studies have shown the advantage of pancreatoenteric anastomosis for preventing pancreatic fistula after distal pancreatectomy. In a prospective trial, Wagner et al. [16] performed an anastomosis of the pancreatic stump into a jejunal Roux-en-Y limb by a single-layer suture after distal pancreatectomy in 23 patients. In this study, we performed to invaginate the pancreatic stump into the stomach by cutting the posterior wall with anastomosis by single layer. Our procedure is very simple and easy to perform within twenty minutes on the average [17]. We consider both the duct-to-mucosa pancreaticogastrostomy

with an internal stenting tube and the pancreatoenteric anastomosis more effective for preventing pancreatic fistula comparing with the traditional methods. However, although their reports did not state the time for complete only the core procedure, it may be natural to understand that our procedure, invaginating the pancreatic stump into stomach with single layer anastomosis, be easy and take shorter time to complete than the duct-to-mucosa pancreaticogastrostomy with an internal stenting tube and the pancreatoenteric anastomosis. Our series, as for now, have had only 5 cases. However, we have no experience to occur grade B, or C pancreatic fistula. We also follow the pancreatic stump in the stomach with the periodical upper endoscopic examination. This is the first report about the change of the pancreatic stump in the stomach. After one-week, massive stump can be seen in the stomach (Figure 2a). However, after 3-month, stump looks very small (Figure 2b), and after one year, we cannot admit the stump at all (Figure 2c). These results may certify that single layer anastomosis is enough to reach the no complication.

Conclusion

The invagination method of the pancreaticogastrostomy may be a simple and effective technique for preventing pancreatic fistula development after distal pancreatectomy. Further clinical trials comparing this method with the other procedures are required to confirm its actual efficacy.

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