

A Reliable Pancreaticojejunal Anastomosis with V-Loc 180 Wound Closure Device for Soft Pancreatic Stump

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ABSTRACT

Background/Aims: Although mortality rates decreased in recent years, pancreaticoduodenectomy is still associated with high morbidity rates. Pancreatic fistula is the leading cause of morbidity after pancreaticojejunal anastomosis and commonly occurs in soft pancreas. The objective of this study is to compare outcomes of conventional modified invaginated end to side pancreaticojejunostomy with a new practical method using V-Loc™ 180 wound closure device in soft pancreas. **Methodology:** Between December 2011 and August 2013, a total of 90 pancreaticoduodenectomy procedures were performed in our hospital. 28 of them were defined as soft pancreas accord-

ing to attending surgeon and included in this study. Patients were divided into two groups consecutively and analysed for postoperative pancreatic fistula (POPF) rate, length of stay, operation time, cost and particular duration of anastomosis. Pancreatic fistulas were classified according to International Study Group on Pancreatic Fistula (ISGPF) definition. **Results:** 1 grade A and 2 grade B fistulas appeared in V-Loc group (Group 1), whereas 1 grade A, 2 grade B and 1 grade C fistulas appeared in conventional anastomosis group (Group 2). **Conclusions:** Pancreaticojejunostomy with V-Loc suture is a convenient method in soft pancreas and can be performed safely.

INTRODUCTION

Pancreaticoduodenectomy (PD) is the main procedure for periampullary tumors and was first performed in 1909 by Kausch, then standardized by Whipple in 1945 (1). Although mortality rates decreased in recent years, morbidity rates are still high even in high volume centers for pancreatic cancer (2,3). Pancreaticojejunostomy (PJ) reconstruction following PD still remains a debate due to high rates of anastomotic leakage that is the major cause of postoperative mortality and morbidity (4). Thus, safety of anastomosis is the primary issue that has effect on short or long-term outcomes of surgery. Although several methods (5-7) described to reduce anastomotic leakages, none of those has been shown to have evident superiority to others (8). The rate of POPF varies from 0-40% in numerous series (9). The pancreaticojejunostomy is performed as either end-to-end anastomosis with invagination of pancreatic stump in jejunum or end-to-side anastomosis with or without duct-to-mucosa sutures (10).

In our center, we prefer to perform PJ as modified end-to-side duct-to-mucosa technic described by Shrikhande et al. in Heidelberg University Hospital, Netherlands (11). This technique has been shown to have lower POPF rates(12). Additionally, it is essential

to have gentle behaviour during construction of anastomosis particularly in soft pancreas (13). V-Loc suture (Covidien) is a new technology that distributes tension across the anastomosis without need to tie knots and offers an effective anastomosis in a continuous and fast manner.

In soft pancreas, laceration of pancreatic capsule due to sutures is a prominent problem of PJ anastomosis. As V-Loc suture provides an anastomosis without knots, we aimed to evaluate its efficacy to reduce POPF rates in soft pancreas. We compared the outcomes of conventional end-to-side duct-to-mucosa PJ technic with its modification by using V-Loc suture.

METHODOLOGY

Between December 2011 and August 2013, a total of 90 pancreaticoduodenectomy procedures were performed in our hospital; 28 of them were defined as soft pancreas according to attending surgeon and included in this study. All surgical procedures are performed by the same surgical team. Soft pancreas was identified according to attending surgeon who is experienced in PD. Patients were divided into two groups consecutively and V-Loc suture used in Group 1 to perform modified end-to-side duct-to-mucosa PJ technic, while conven-

TABLE 1. Comparison of Group 1 and Group 2 demographics and technical findings.

	Group 1 (V-Loc group) N:14	Group 2 N:14	Total N:28	P
Age	63,86±11,8	61,29±11,68	62,7±11,5	0,567
Gender(M/F)	2,5	1,8	2,1	0,68
Operation time(minutes)	318,5±42,9	347,1±62,6	332,8±54,6	0,171
Anastomosis time(minutes)	21,3±2,02	25±2,5	23,1±2,9	<0.005
Hospital stay	9,07±3,04	10±4,1	9,5±3,5	0,505
Wirsung size	3,46±0,8	3,6±0,7	3,53±0,7	0,627
Anastomosis cost (dollars)	60	63	64,5±11,7	>0,1

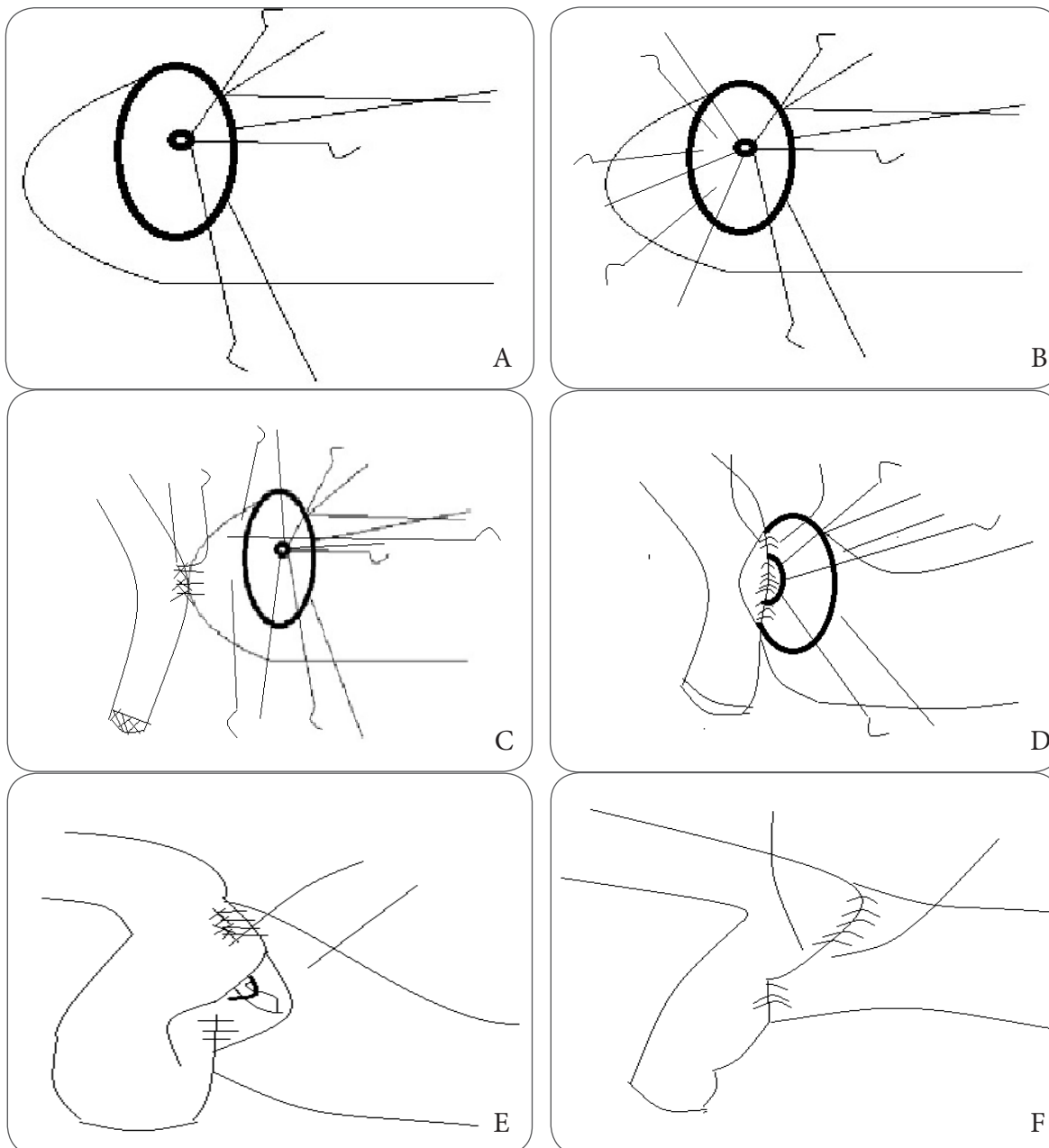


FIGURE 1. Modified end-to-side invaginated pancreaticojejunal anastomosis, a, placement of sutures on the anterior wall of the pancreatic duct, b, placement of sutures on the posterior wall of the pancreatic duct, c, placement of interrupted sutures on the posterior aspect of the pancreas and coming onto the seromuscular layer of the jejunum, d, placement of interrupted sutures between the posterior cut margin of the pancreas and full thickness posterior wall of the opened jejunum, the preplaced posterior sutures are also used, e, placement of interrupted sutures between the anterior wall of the pancreas and the jejunum, the preplaced anterior sutures are also used, f, placement of interrupted sutures between the anterior cut margin of the pancreas and anterior seromuscular wall of the jejunum.

TABLE 2. Postoperative pancreatic fistula rates.

Tip a fistula	1	1	2
Tip b fistula	2	2	4
Tip c fistula	0	1	1
Total	3	4	7

tional modified end-to-side duct-to-mucosa PJ technic was performed in Group 2.

Surgical technique

Conventional modified end-to-side duct-to-mucosa PJ technic is shown in **Figure 1** and modified anastomosis technic using V-Loc suture is shown in **Figure 2**. In this study, we used V-Loc suture to perform posterior side and upper border of PJ anastomosis in a continuous manner. One drain tube to subhepatic area and another one to posterior to PJ anastomosis were used in all patients.

The diagnosis of POPF was defined as a drain output of any measurable amount on or after postoperative day 3rd with amylase activity greater than three times of serum amylase level and pancreatic fistulas were classified according to ISGPF definition (14). Both groups were analysed for POPF rate, length of stay, operation time, cost and particular duration of anastomosis.

RESULTS

The demographics and results of compared data are shown in **Table 1**. The mean age of patients were 63.8 and 61.2 in group 1 and 2, respectively. The mean operation time was 318.5 minutes in group 1 and 347.1 minutes in group 2. The mean duration of anastomosis took 21.3 minutes in group 1 and 25 minutes in group 2. The differences in operation time between two groups are not statistical significance whereas the difference in anastomosis time had statistical significance. POPF rates are shown in **Table 2**. 1 grade A and 2 grade B fistulas appeared in group 1, whereas 1 grade A, 2 grade B and 1 grade C fistulas appeared in group 2. There was no grade C fistula appeared in group 1. The difference of POPF between two groups is not statistically significant. The mean postoperative length of stay were 9.07 and 10 days in group 1 and 2, respectively, that the difference has no statistical significance.

Another parameter is the cost specified to anastomosis. In group 1, we used 2 4-0 V-Loc and 8 5-0 PDS (Ethicon; Johnson and Johnson with atraumatic JRB – 1 [5/8] needle) sutures. In group 2, we used a total of 18 no: 5-0 PDS sutures. There is no statistically significant difference between two groups in terms of specified cost of anastomosis.

DISCUSSION

PJ anastomosis is a critical step of PD. There are quite a few different methods described to perform a safer PJ anastomosis in various centers around the world (15). It is considered a safe procedure resulting from the continuous improvement in surgical techniques over the years (15). Although postoperative mortality has obviously decreased, pancreatic fistula is still a major challenge in pancreatic surgery and remains the major cause of postoperative morbidity and mortality after PD, ranging from 5% to 30% (15). Currently, several

techniques and modifications have been proposed for pancreatic anastomosis over the past few decades, including the conventional duct-to-mucosa method (18), pancreaticogastrostomy (19), Peng's binding method, dunking method and end-to-side invaginated method. Unfortunately, in the cases of normal soft pancreas with a small main pancreatic duct, it is difficult to perform the duct-to-mucosa approach. It always leads to a self-incision for the duct, along with an inadequate drainage for the pancreatic juice from the main pancreatic duct after the anastomosis. This results in a postoperative pancreatic fistula. Shrikhande et al. described a modified end-to-side invaginated PJ technic that suggested lower rates of POPF and morbidity rates in their series (12). Hence, we usually perform this technic for PJ anastomosis in our clinic. However, anastomosis of soft pancreas still carries significant anastomotic difficulties (16,17). The pancreatic texture is known to be the most important factor predicting safety of anastomosis and POPF (18-20,21). Sugiyama and colleagues examined four pancreatic specimens with soft pancreatic texture and small main pancreatic duct, and found that there were about 5–7 tiny collateral pancreatic ducts on the cutting surface of the pancreatic remnant (22). We thought that the secretion from the cut surface might be the risk factor for POPF, so we closed the pancreatic remnant to reduce the risk of the fistula as well as postoperative hemorrhage.

V-Loc suture is a copolymer of glycolic acid and trimethylene carbonate which has unidirectional shallow barbs with circumferential distribution and anchors device at the beginning of the suture that provides a suture without tension and any knots. In this study, we used V-Loc suture to perform posterior side and upper border of PJ anastomosis in a continuous manner. We noticed that it is efficient to reduce tension during anastomosis and decrease the particular duration of anastomosis without increasing the cost specified to anastomosis. Complications were graded according to Clavien's classification (10) and the POPF was diagnosed according to the International Study Group of Pancreatic Fistula (ISGPF) guidelines. The definition of pancreatic fistula is a drain output of any measurable volume of fluid on or after POD 3 with the amylase content greater than 3 times the serum amylase activity. Three different grades of POPF (grades A, B, C) are defined by ISGPF according to the clinical impact on the patient's hospital course. Grade A, also called "transient fistula", has no clinical impact. A CT scan typically shows no peripancreatic collections and the use of total parenteral nutrition, antibiotics, or somatostatin analogues are not needed. Grade B is always associated with abdominal pain, fever, and/or leukocytosis, and antibiotics are usually required; somatostatin analogues may also be used. A CT scan may show peripancreatic collections requiring repositioning of the drains. Often the patient is fasting and supported with partial or total parenteral or enteral nutrition that usually leads to a delayed discharge. Grade C is severe, and always shows a major change in clinical management or a deviation from the normal clinical pathway. A CT scan usually shows worrisome peripancreatic collections that require percutaneous drainage or re-exploration. There are often associated complications such as sepsis and organ dysfunction, and the possibility of postoperative mortality rises (23). PJ performed by modified technic using V-Loc suture has no statisti-

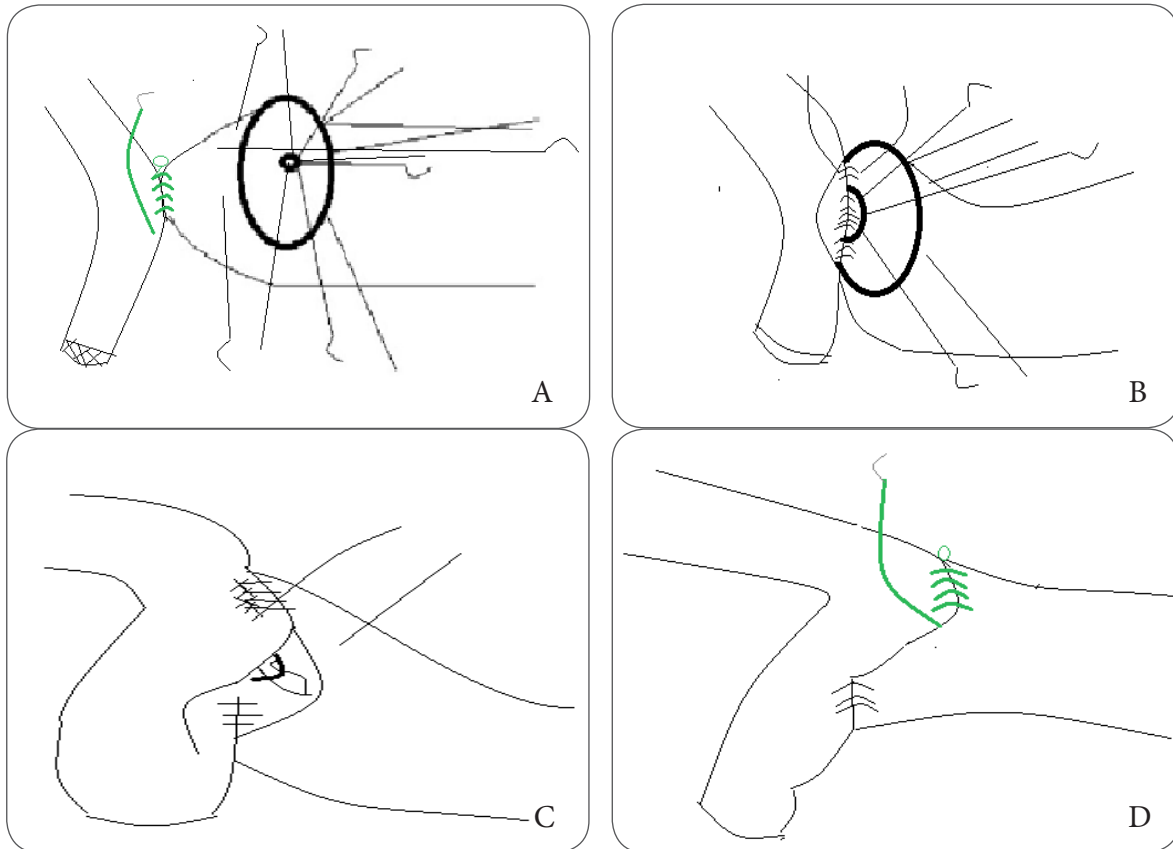


FIGURE 2. End-to-side invaginated Pancreaticojejunostomy with V-loc suture, a. placement of continuous V-loc suture on the posterior aspect of the pancreas and coming onto the seromuscular layer of the jejunum, b. placement of interrupted sutures between the posterior cut margin of the pancreas and full thickness posterior wall of the opened jejunum, c. placement of interrupted sutures between the anterior wall of the pancreas and the jejunum, d. placement of continuous V-loc suture between the anterior cut margin of the pancreas and anterior seromuscular wall of the jejunum.

cally significant difference on POPF rates and length of stay. However, we should note that no grade C fistula was seen in V-Loc group.

In 10th Congress of European-African Hepatobiliary Association in Belgrade, the accurate definition of soft pancreas is discussed and the experience of surgeon submitted to be the most reliable property as a final decision. In this study, the surgical team was experienced in this area and had no confusion to identify a soft pancreatic stump.

The size of pancreatic duct is another critical factor predicting POPF following PJ anastomosis (23). In this study, the mean size of pancreatic canal in two groups has no statistically significant difference. Appropriate surgical technique and perioperative management as well as understanding accurate risk factors are mandatory to reduce POPF. Efforts to reduce the incidence of POPF have encompassed various modifications of the anastomotic technique and pharmacological measures, pancreaticogastrostomy or pancreaticojejunostomy,

duct-to-mucosa, invagination, the use of stents, internal or external drainage, application of topical agents to the anastomotic site, placement of an autologous graft such as omentum or falciform ligament on the anastomotic site, and prophylactic administration of somatostatin or its analog (22).

Preoperative patient stratification using accurate risk factors may lead to careful management in high-risk patients, and well-designed surgical trials can be exploited to improve the surgical technique and perioperative management. The main restriction of our study is relatively low number of patients. New well-designed, prospective studies are mandatory to show efficacy and safety of this new technic.

CONCLUSIONS

Our results show that this new modified PJ technic using V-Loc suture can be performed safely in soft pancreas.

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