



Research Article

Wirsung Duct Occlusion Versus Pancreaticojejunostomy after Pancreaticoduodenectomy

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Abstract

Background: Postoperative pancreatic fistula is still a cause of major morbidity after pancreaticoduodenectomy. The optimal management of the pancreatic remnant is still controversial. Our aim was to analyze the role of two different procedures in the management of pancreatic stump in a single surgical unit.

Methods: We report our experience on 40 consecutive patients who underwent pancreaticoduodenectomy over a 6-year period and compare results between occlusion of the pancreatic duct and pancreaticojejunostomy.

Results: A total of 40 patients who underwent pancreaticoduodenectomy were included in the study, 20 with a pancreaticojejunostomy and 20 with chemical occlusion of the pancreatic duct. Patient's characteristics, operative and recovery data were similar between groups. The most frequent postoperative complication was pancreatic fistula; although incidence rate was higher in the duct occlusion group the difference was not statistically significant.

Conclusions: There is no agreement on the optimal approach to the pancreatic stump after pancreaticoduodenectomy. Pancreaticojejunostomy is still the procedure of choice but further large randomized trials are needed to compare different methods of pancreatic remnant management. Nevertheless, it seems wise for pancreatic surgeons as well as general surgeons to be able to perform more than one technique to offer the patient higher probability of success.

Keywords

Pancreatic duct occlusion, Pancreaticoduodenectomy, Pancreaticojejunostomy, Pancreatic fistula

Introduction

Pancreaticoduodenectomy is still the only curative operation for malignancies of the pancreatic head [1,2]. Mor-

bidity and mortality after this procedure have significantly decreased over time due to greater surgical experience and improved perioperative care; therefore it is now accepted for various malignant and benign diseases such as chronic pancreatitis [3]. Most morbidity is often secondary to pancreaticojejunostomy leakage, which has been reported with a frequency varying from 0 to 19.6% [4-9]. Several authors have tried the use of a chemical substance for closure of the pancreatic duct to avoid complications from a pancreatic anastomosis [10-12]. Moreover, only a few studies have compared results after pancreatic duct occlusion and pancreaticojejunostomy [13,14], the use of a chemical substance may be an alternative technique but no definitive conclusion can be made.

We report our experience on 40 consecutive patients who underwent pancreaticoduodenectomy over a 6-year period and compare results between occlusion of the pancreatic duct and pancreaticojejunostomy.

Methods

After approval of institutional review board, the medical records of 40 consecutive patients undergoing pancreaticoduodenectomy at our institution were retrospectively reviewed. All patients signed informed consent before the surgical procedure. All clinical, operative, and pathologic data were obtained from medical records and the following information was analyzed: patient demographics and comorbid illness, preoperative laboratory values, histopathologic diagnosis, operative details, postoperative recovery and follow-up. Operative details included duration of the operation, estimated blood loss, intraoperative

transfusions of red blood cells, and operative technique. Postoperative data included early and late complications, resumption of bowel movements and oral intake, and length of stay. The operative risk was determined by the American Society of Anesthesiologists (ASA) classification score.

All patients underwent Whipple's procedure with standard lymphadenectomy. During the same study period, two variations of pancreaticoduodenectomy were performed according to the surgeon evaluation of local condition. When pancreatic texture was hard and fibrotic a Roux-en-Y duct-to-mucosa pancreaticojejunostomy was undertaken, whereas in cases of soft and friable pancreatic remnant the pancreatic duct was occluded with a sclerosing substance. In all patients, an abdominal drain was inserted near the pancreatic stump, and measure of drainage amylase levels was performed on day 3 and 7 to exclude pancreatic leak. An additional drain was placed near the hepaticojejunostomy. Post-operative pancreatic fistula was defined as any measurable drain output with an amylase content greater than 3 times the upper normal serum value. All pancreatic leaks were graded according the International Study Group of Pancreatic Fistula (ISGPF) definition [15].

Follow-up data from the time of surgical therapy were available for 28 (70%) patients with a median follow-up time of 14.5 months (1-65 months).

Chi-square or t-test test were used for the statistical analysis and a probability value of less than 0.05 was considered significant. The statistical review of the study was performed by a doctor experienced in biomedical statistics.

Results

A total of 40 patients who underwent pancreaticoduodenectomy over a 6-year period were included in the study, 20 patients with a pancreaticojejunostomy (15 end-

to-side and 5 end-to-end) and 20 patients with chemical occlusion of the pancreatic duct obtained by injection of neoprene (n = 10), bucrylate (n = 5), or cyanoacrylate (n = 5). Patients' characteristics were similar between groups and are reported in Table 1. Operative and recovery data are presented in Table 2; there was no significant difference in those parameters between groups.

Postoperative complications are summarized in Table 3. The most frequent complication in both groups was the occurrence of pancreatic fistula (14 patients, 30%); although incidence rate was higher in the duct occlusion group as compared to the pancreaticojejunostomy group (40 vs 20%) the difference was not statistically significant (p = 0.17). Pancreatic leak grade was as follows: A in 2, B in 1, and C in 1 subjects for the anastomosis group; A in 6, B in 2, and C in 0 cases for the other group. All differences were not statistically significant between groups.

Four patients in each group underwent relaparotomy. Indications for reintervention were: sepsis from biliary or pancreatic leak (1 patient each), and bleeding (2 patients) in the pancreaticojejunostomy group; bleeding (3 patients), and biliary leakage (1 patient) in the duct occlusion group.

Perioperative mortality within 30 days after surgery was 10% (2/20) in the pancreaticojejunostomy group and 5% (1/20) in the duct occlusion group (p = 0.55). The two patients in the former group died from sepsis secondary to biliary leakage and pancreatic fistula, respectively. The patient in the latter group died from acute renal failure.

The 3-year survival rates for patients with pancreaticojejunostomy and duct occlusion were 15% and 5%, respectively (p = 0.29).

Discussion

The optimal approach for management of the pan-

Table 1: Patient's characteristics.

	Total n = 40 (%)	Pancreaticojejunostomy n = 20 (%)	Pancreatic duct occlusion n = 20 (%)
Age			
Mean	62.1	62.5	61.7
Range	45-75	45-75	46-75
Sex			
Male	26 (65)	12 (60)	14 (70)
Female	14 (35)	8 (40)	6 (30)
ASA classification score			
I	11 (27.5)	7 (35)	4 (20)
II	20 (50)	9 (45)	11 (55)
III	9 (22.5)	4 (20)	5 (25)
Pathology			
Pancreatic adenocarcinoma	24	11	13
Periampullary adenocarcinoma	10	6	4
Duodenal adenocarcinoma	4	2	2
Cholangiocarcinoma	1	-	1
Chronic pancreatitis	1	1	-

Table 2: Operative and postoperative data.

	Total n = 40	Pancreaticojejunostomy n = 20	Pancreatic duct occlusion n = 20	P value
Operative time (min)				
Mean	454	480	428	0.76
Range	360-660	360-660	360-540	
Intraoperative blood transfusions (units)				
Mean	1.6	1.8	1.4	0.81
Range	0-7	0-7	0-3	
Intensive care stay (days)				
Mean	1.2	1.2	1.2	0.93
Range	0-8	0-8	0-7	
Bowel movements (days)				
Mean	7.7	7.6	7.8	0.75
Range	3-16	3-16	5-12	
Oral intake (days)				
Mean	10.6	11.6	9.6	0.01*
Range	7-22	7-22	7-14	
Hospital stay (days)				
Mean	26.4	25.9	27	0.21
Range	11-62	11-62	12-49	

*statistically significant.

Table 3: Postoperative complications.

	Pancreaticojejunostomy n = 20 (%)	Pancreatic duct occlusion n = 20 (%)	P value
Complication			
Pancreatic leak	4 (20)	8 (40)	0.17
Bleeding	3 (15)	3 (15)	1
Dumping syndrome	2 (10)	3 (15)	0.63
Biliary leak	2 (10)	1 (5)	0.55
Abscess	2 (10)	-	
Small bowel obstruction	1 (5)	-	
Total	14	15	

creatic remnant after pancreaticoduodenectomy is still under debate; a variety of techniques have been employed and evaluated over the years, however no definite conclusion can be made. A review on this topic by Shrinkhande, et al. [3] has concluded that the surgeon is probably the most important factor in prevention of a pancreatic leak, and this is also related to the surgical volume handled. Furthermore, experienced pancreatic surgeons must have more than one technique in their armamentarium for managing the pancreatic stump in different operative scenarios.

Pancreatic fistula remains the most threatened complication after pancreaticoduodenectomy, being a major cause of morbidity and mortality. Pancreaticojejunostomy has been the most common technique used to manage the pancreatic remnant; leakage from this anastomosis has been reported with a frequency varying from 0 to 19.6% [4-9]. Total pancreatectomy has been proposed to obviate the need for a pancreatic anastomosis but it is associated with severe endocrine and exocrine dysfunctions, and therefore no more recommended as a routine practice [16]. A pancreaticogastrostomy has been used as an alternative anastomotic technique because it is easier to perform with respect to pancreaticojejunostomy, and also because the excellent vascularization of the gastric

wall can promote favorable healing. Recent meta-analyses concluded that pancreatic fistula rate is significantly lower after pancreaticogastrostomy compared with pancreaticojejunostomy [17-20]. However, some randomized control trials failed to demonstrate any advantage of pancreaticogastrostomy over pancreaticojejunostomy for fistula rate [21-24]. Another option is the occlusion of the pancreatic duct with a chemical substance; the results after this procedure have been compared with those of pancreaticojejunostomy in a prospective randomized trial by Tran, et al. [13] and in a retrospective series by Farsi, et al. [14]. Both studies observed a similar complication rate in the two groups though there was a higher incidence of pancreatic fistula in the duct occlusion group; they concluded that there is no advantage in avoiding a pancreaticojejunostomy and this remains the procedure of choice. Recently, Mezza, et al. [25] have retrospectively evaluated the metabolic assessment of 50 patients after pancreaticoduodenectomy: 23 patients underwent pancreatic duct occlusion with acrylic glue and were compared with 27 matched controls who underwent pancreaticojejunostomy. Pancreatic fistula rate was similar in both groups (24% vs. 26%), a reduction in insulin secretion was observed in the duct occlusion group but there was not a significant difference in the

occurrence of postoperative diabetes. Moreover, Alfieri S, et al. [26] reported on postoperative endocrine and exocrine function in 204 patients who underwent pancreaticoduodenectomy with occlusion of the main duct (cyanoacrylate). Pancreatic fistula occurred in 54% of patients. At 1-year follow-up, 31% of subjects required insulin for postoperative diabetes and 80% of patients were using substitutive enzymes for exocrine insufficiency. According to others [13,27], there are no advantages in avoiding a pancreaticojejunostomy because obliteration of the pancreatic duct without anastomosis is associated with significantly higher risk of endocrine insufficiency. However, it is generally accepted that a pancreatic leak resulting from a pancreatico-enteric anastomosis is more dangerous because pancreatic enzymes activation by the enteric fluid is usually responsible for pancreatic fistula-related complications. Therefore, pancreatic remnant occlusion has been proposed as a safe, time consuming, and less complicated alternative management of the pancreatic stump [28], and this is particularly indicated in high-risk elderly patients in whom the occurrence of pancreatic fistula-related complications may lead to death [29].

In the present material we reviewed our experience on 40 consecutive patients who underwent pancreaticoduodenectomy to compare results between occlusion of the pancreatic duct and pancreaticojejunostomy. The limited number of patients, the retrospective nature, and patient selection based on anatomical characteristics of the pancreatic remnant represent limitations of the study; nevertheless randomized studies do not take into account the texture of pancreatic stump. In our series complication rates were similar between groups; there was a trend towards greater pancreatic leak in the duct occlusion group, however it did not reach statistical significance probably because of the low number of patients observed. It is not possible from our material to make a definitive conclusion on the optimal management of the pancreatic remnant. However, our data indicates that results were similar in both groups and, therefore, pancreatic duct occlusion may be considered as an alternative technique in difficult cases with soft pancreatic texture.

In conclusion, there is no agreement on the optimal approach to the pancreatic stump after pancreaticoduodenectomy. Pancreaticojejunostomy is still the procedure of choice but further large randomized trials are needed to compare different methods of pancreatic remnant management. Nevertheless, it seems wise for pancreatic surgeons as well as general surgeons to be able to perform more than one technique to offer the patient higher probability of success.

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