Prevention Of Pancreaticojejunal Fistula After Whipple Procedure

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Abstract

Pancreateicobiliary fistula formation is the most frequent site of fistula formation in patients undergoing Whipple procedure (pancreateicojunostomy). The results of an end-to-side anastomosis of the pancreatic stump to the jejunum, are discussed in this retrospective review of 27 patients underwent Whipple procedure for cancer of the pancreas or periampullary region.

INTRODUCTION

The role of surgical resection in the treatment of pancreatic cancer was established in 1935 by Whipple and associates with the demonstration that resections of the head of the pancreas could be technically performed. Accumulated clinical experience with pancreatic resections has demonstrated that radical surgical treatment of pancreatic cancer results in significant morbidity and mortality and is applicable only to a small fraction of patients with pancreatic malignancies. International literature suggests that in most patients, pancreatic malignancies are diagnosed at late stages when surgical cure by any type of procedure is not possible.

Pancreateicojunostomy generally, is considered to be the standard operation for resection of carcinomas of the pancreas or periampullary region. The Whipple operation comprises an en bloc resection of the duodenum, the distal bile duct and the gastric antrum. Pancreateicojunostomy procedure has had many technical variations described, typically dealing with the extent of dissection or with the details of reconstructing the gastrointestinal tract after the resection.

Various series have appeared in the medical literature reporting the overall results of pancreateicojunostomy resections. Most series report operative mortality rates averaging 20% for pancreateicojunostomy resections for carcinoma of the pancreatic parenchyma with 3-year survivals averaging under 15% and 5-year survivals averaging 10% or less. Pancreateico-duodenectomy series performed for peri-ampullary tumors show an average perioperative mortality of 15%, a 3-year survival of 30% and a 5-year survival approaching 20% range.

Complication rates are high in patients undergoing the Whipple procedure with complications of some type developing in more than 50% of patients. The most common complication after pancreateicojunostomy is fistula formation from the anastomoses at the sites of gastrointestinal tract reconstruction. The pancreateicojejunal anastomosis is technically difficult to perform and is the most frequent site of fistula formation. It is important that the pancreateicojejunal anastomosis to be a secure anastomosis because the leakage of pancreatic secretions from the anastomosis can have potentially fatal consequences.

Many technical modifications have been proposed such as an end-to-end or an end-to-side anastomosis. Many other authors propose the avoidance of pancreateicojejunal anastomosis (total pancreatectomy, oversewn of pancreatic remnant). In this paper an end-to-side anastomosis of the pancreatic stump to the jejunum is discussed.

MATERIALS AND METHODS

Twenty seven patients (19 men and 8 women [mean age: 58.5 years]) with pancreatic or periampullary cancer, eligible for elective pancreatic resection were enrolled in this study (Table 1).
After pancreatic resection, the reconstruction of the alimentary tract has to be performed. Reconstruction involves gastro-jejunostomy, choledochojejunostomy and pancreaticojejunostomy. According to the method used in the 1st Surgical-Oncological Department of Theagenion Cancer Hospital, gastrojejunostomy is placed distal to choledochojejunostomy and pancreaticojejunostomy to allow the gastrojejunostomy to be bathed in alkaline biliary and pancreatic secretions. Exposure of the gastrojejunostomy to alkaline resections minimizes the risk of marginal ulceration caused by the sensitivity of the jejunal mucosa to gastric acid. Pancreatico-jejunostomy is the most proximal anastomosis. For the pancreaticojejunostomy two steps have to be performed:

1. The traumatic surface of the pancreatic stump is ligated with locking sutures 3-0 silk (1st step).

2. A two-layers end-to-side anastomosis is performed
(1st layer: jejunal mucosa-pancreas, 2nd layer: jejunal serosa-pancreas).

For this study protocol, eleven typical complications were defined (Table 2) and each patient was followed for 90 days postoperatively. All patients received octrotide at 3/100 µg/day subcutaneously to achieve the maximal inhibition of pancreatic enzyme secretion

### RESULTS
The postoperative incidence of pancreaticojejunal fistula was zero. There were many other complications (Table 3) unrelated to the formation of pancreaticojejunal anastomosis. The most severe one, was a gastric marginal bleeding on the 9th postoperative day and the patient needed relaparotomy.

### TABLE 2: Definition of postoperative complications.

<table>
<thead>
<tr>
<th>COMPLICATION</th>
<th>DEFINITION</th>
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<tbody>
<tr>
<td>Death</td>
<td>Within 90 days postoperatively</td>
</tr>
<tr>
<td>Leakage of anastomosis</td>
<td>Leakage of pancreatic, biliary or intestinal anastomosis as determined by X-ray or intraoperative (relaparotomy) findings.</td>
</tr>
<tr>
<td>Pancreatic fistula</td>
<td>Concentration of amylase and lipase in the drainage fluid later than 3 days postoperatively of more than 3 times the serum concentration and a drainage volume of more than 10 ml per day at the same time.</td>
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<tr>
<td>Abscess</td>
<td>Pus collection or an infected fluid collection revealed by CT or ultrasound or demonstrated by relaparotomy.</td>
</tr>
<tr>
<td>Fluid collection</td>
<td>Collection of sterile fluid of at least 500 cm in diameter by ultrasound or CT which did not qualify as an abscess.</td>
</tr>
<tr>
<td>Shock</td>
<td>Systolic blood pressure of less than 80 mm Hg for more than 20 min (later than 24 h postoperatively) which required continuous volume replacement and/or treatment with catecholamines.</td>
</tr>
<tr>
<td>Sepsis</td>
<td>4 or more of the following criteria: a) bacteria positive blood culture, b) rectal temperature &gt; 38,5 °C; c) leucocytosis &gt; 12,000/mm³ or leucopenia &lt; 3,000/mm³; d) thrombocytopenia 100,000/mm³; e) metabolic acidosis (base excess &lt;-4).</td>
</tr>
<tr>
<td>Pulmonary insufficiency</td>
<td>Arterial PO2 &gt; 60 mm Hg, despite oxygen application via the mask, or required prolonged postoperative mechanical ventilation (&gt; 24 h after the end of operation) or reintubation.</td>
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<tr>
<td>Renal insufficiency</td>
<td>Serum creatinine more than twice the preoperative value.</td>
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<tr>
<td>Bleeding</td>
<td>Replacement of more than 3 units of blood later than 24 h after the end of operation or the indication for relaparotomy due to intraduodenal bleeding.</td>
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<tr>
<td>Acute pancreatitis</td>
<td>More than 3-fold increase in serum amylase or lipase later than 3 days after surgery, accompanied by morphological signs of acute pancreatitis in a contrast-enhanced CT scan; CT was mandatory in patients with a 3-fold increase in serum amylase or lipase on postoperative day 4 or later.</td>
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### TABLE 3: Mortality and complications

- **Mortality**: 0/27
- **Complication rate (Patients with 1 or more complications)**: 1/27
DISCUSSION

The significant mortality and morbidity of pancreatic resection raises questions by surgeon oncologists of whether the small possibility of cure is justified by the price of possible death from surgery or of complications that can lead to prolonged hospitalization. The most common complication is the pancreaticojejunal fistula formation. In a series reported by Pessaux and associates, postoperative fistulas occurred in 177 patients, for an overall fistula complication rate of 21.5%. Leakage from the pancreaticojejunal anastomosis occurred in 114 patients (13.9%), biliary fistulas occurred in 45 patients (5.4%) and gastric fistulas developed in 18 patients (2.2%).

Although Cameron and associates reported 145 pancreaticoduodenectomies without death, mortality and morbidity rates are the main problem of pancreatic resection.

In the study presented here, despite the fact that mortality was zero, morbidity rate was significantly high (10/21 patients - 47.6%) but with no pancreaticojejunal fistula formation among the complications.

Formerly, total pancreatectomy was proposed as a more appropriate operation for pancreatic carcinoma. Support was based on a reported 30-40% incidence of multifocality of pancreatic cancer, a concern about tumor cell implantation into the remnant pancreatic duct at Whipple resection and the high mortality and morbidity associated with the pancreaticojejuno-stomy. As the literature has substantiated concerns about tumor seeding and multicentricity are not relevant, because the 5-year survival rate in patient who undergo the classic total pancreatectomy is equivalent to that in patients who undergo Whipple resection. Also improved techniques and postoperative management have made pancreaticojenostomy safer. Total pancreatectomy removes all exocrine and endocrine pancreatic function, requiring exogenous pancreatic enzyme and insulin administration.

An alternative method to avoid pancreaticojejuno-stomy is to ligate the remnant either with intraductal blocking or not and leave it free but well-drained in the abdominal cavity. Despite the fact that ligation of the remnant causes more fistulas than pancreatico-jejunostomy, fistula formation after pancreatico-jejunostomy is more dangerous. Possibly there is an activation of pancreatic enzymes caused by the enteric secretions. Activated pancreatic fluid is more corrosive compared to the fluid secreted by the isolated pancreatic remnant.

The modification described in this paper is simple. Excretion of pancreatic fluid inside jejunum is inhibited, in order to avoid mixing of pancreatic and enteral secretions and activation of pancreatic enzymes.

Even though, the number of treated cases was few, the early experience has indicated successful results in pancreaticojejuno-stomy formation.

References
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