Completion Pancreatectomy for Postoperative Peritonitis After Pancreaticoduodenectomy

Early and Late Outcome

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Hypothesis: Completion pancreatectomy in patients with pancreatic leakage associated with postoperative peritonitis after pancreaticoduodenectomy is a viable salvage procedure.

Design: Retrospective analysis from a cohort of consecutive patients admitted between January 1, 1989, and December 31, 1999, for postoperative peritonitis originating from pancreaticojejunostomy leakage.

Setting: Tertiary referral center with surgical intensive care unit specializing in the treatment of intra-abdominal sepsis.

Patients: Eight consecutive patients with postoperative peritonitis originating from pancreaticojejunostomy after pancreaticoduodenectomy, with a mean Acute Physiology and Chronic Health Evaluation II score of 18.6. We excluded patients with pancreatic fistulas or abscesses amenable to percutaneous drainage or other conservative treatment.

Intervention: Completion pancreatectomy.

Main Outcome Measures: Mortality, morbidity, and long-term outcome, which was assessed by interview.

Results: Three patients died in the postoperative period: 2 required early reoperation during the postoperative period and died of hemorrhage and sepsis, and 1 died of multiorgan failure without reoperation. Recurrence of carcinoma was responsible for late death of 2 other patients.

Conclusions: Postoperative peritonitis after pancreaticoduodenectomy still has high mortality; however, completion pancreatectomy may represent the only means to achieve source control of infection in cases of postoperative peritonitis.

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HIPPLE ET AL,1 Inspired by the work of Kausch,2 popularized the use of pancreaticoduodenectomy more than 65 years ago. Since then, operative mortality has been significantly reduced to about 5% in specialized centers.3-5 However, morbidity remains high, between 30%6 and 60%.7 Common complications include hemorrhage, intra-abdominal abscesses, and leakage of the anastomosis of the pancreatic remnant to the gastrointestinal tract. Mortality in patients with pancreatic anastomotic leakage is reported to be between 8% and 40%.5,8,9 Treatment of pancreatic anastomotic leakage depends on the presence or absence of peritonitis. Although leakage not associated with peritonitis can be treated medically combined with percutaneous drainage if necessary, this conservative approach is not possible for pancreatic leakage associated with peritonitis.

METHODS

PATIENTS

Surgical Procedure

For all patients, peritonitis was confirmed during laparotomy. The surgical procedure included a laparotomy for complete exploration and lavage of the abdominal cavity, and primary abdominal wound closure. The pancreatic remnant was averted. The jejunal stump of the pancreas was described by the surgeon as normal in 7 patients and hard in 1 patient. The pancreatic duct was managed by nonintussuscepting pancreaticojejunostomy (n=7) and pancreaticogastrostomy (n=1). Partial portal vein resection followed by reconstruction was performed in 1 patient, and 1 other patient required dissection of the celiac trunk under intermittent vascular exclusion of 2 hours for extrinsic compression of the celiac trunk.

Medical comorbidity was present in 7 patients: cardiac disease (n=3), chronic respiratory insufficiency (n=1), familial adenomatous polyposis (n=1), alcoholism (n=1), and previous gastric resection for ulcer followed by a gastrojejunostomy (n=1).

Postoperative peritonitis in patients operated on at our institution was suspected with the appearance of fever (n=7) and abdominal tenderness (n=6). Failure of at least 1 organ was an indication for reoperation in 6 patients. The mean number of organs failed in these 6 patients was 2 (renal insufficiency, n=2; shock, n=5; liver failure, n=1; pulmonary deficiency, n=1). In 1 patient, operation was indicated because fluid was found in the peritoneal cavity on ultrasonography. The patient referred to our institution was in shock and required artificial ventilation.

The median time between the initial operation and treatment in this department was 6 days (range, 2-11 days). The referred patient was operated on the same day he was admitted (day 3 after initial operation). The mean±SD APACHE (Acute Physiology and Chronic Health Evaluation) II score,13 measured within 24 hours of operation for pancreatic leak associated with postoperative peritonitis, was 18.6±5.2 (median, 17.5; range, 12-28).

RESULTS

Gastrointestinal tract after completion pancreatectomy, showing stoma (1) and Witzel feeding jejunostomy placement (2).

Surgical findings are detailed in the Table. Three patients had Mikulicz drainage, 1 in the Douglas pouch and

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2 in the pancreatic area. Five patients had their abdominal wall closed conventionally and 3 had exclusive cutaneous closure. The intraperitoneal microorganisms associated with postoperative peritonitis were *Candida albicans* (n = 1), *Escherichia coli* (n = 5), *Proteus* species (n = 1), *Pseudomonas* species (n = 1), and *Enterobacter cloacae* (n = 2). Two patients had polymicrobial infection and 6 had monomicrobial infection.

### OPERATIVE MORTALITY AND MORBIDITY

Three patients (38%) died in the early postoperative period (2, 19, and 57 days after completion pancreatectomy). Two of these patients required early reoperation. One patient had a recurrent intra-abdominal abscess due to jejunal necrosis. He was reoperated on 49 days after completion pancreatectomy and had a partial jejunal resection with intubation of gastrojejunal anastomosis and double entero stomy. He died 8 days later. One patient had postoperative bleeding secondary to splenic vein erosion, associated with biliary and gastric anastomosis leak. He was reoperated on for splenic vein ligation and intubation of both anastomosis. He died 11 days later.

Six patients had postoperative medical complications: hypoglycemia (n = 2), pneumopathy (n = 2), myocardial infarction (n = 1), renal failure (n = 2), and severe confusion (n = 1). Mean hospital stay was 64 days for survivors.

### LONG-TERM OUTCOME

Four patients had their enterostomy closed without mortality or morbidity. Two patients died of cancer recurrence in the year after their Whipple procedure (11 and 13 months). An enterocutaneous fistula appeared 13 months after pancreatic completion and required resection of the fistulated gastrojejunostomy and a new gastrojejunostomy.

None of the patients died of the consequences of diabetes. Two patients had severe diabetic complications: severe hypoglycemia without the need for hospitalization (n = 1) and hypoglycemic coma with neurologic complications (n = 1). The other 2 patients had difficult diabetes control with regimens of subcutaneous low-dose insulin, 0.38 U/kg per day. Moreover, 1 of these 2 patients had intolerance to oral pancreatic enzyme and experienced diarrhea and malabsorption.

### COMMENT

The safety of the pancreatic anastomosis is closely related to the quality of the pancreatic remnant. While there is no more than 8% anastomotic leak in chronic pancreatitis, it can reach 14% to 23% when the pancreatic parenchyma is normal. Among patients with a postoperative pancreatic anastomotic leak, 70% to 80% can be treated nonoperatively, but 10% to 15% need invasive attempts and percutaneous drainage of intra-abdominal abscess. Moreover, 10% to 15% of the patients with pancreatic anastomotic leak develop severe complications such as peritonitis or bleeding, requiring reintervention. Few articles have been written about the results of completion pancreatectomy in the early postoperative period regarding the management of postoperative peritonitis associated with pancreatic leakage. Most published series about completion pancreatectomy mention it as a means to control postoperative complications such as uncontrollable anastomotic leaks, bleeding, or abscesses, but not specifically peritonitis. In our group of patients, completion pancreatectomy was chosen as a salvage procedure for the treatment of postoperative peritonitis associated with pancreatic leakage.

The importance of considering postoperative peritonitis separately has been stressed by many authors. This distinction between other forms of peritonitis and post-

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**Patients and Operative Findings**

<table>
<thead>
<tr>
<th>Patient No./ Sex/Age, y</th>
<th>Reintervention (Operative Day)</th>
<th>Operative Findings</th>
<th>APACHE II</th>
<th>Follow-up Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/F/51</td>
<td>Completion pancreatectomy, splenectomy (11)</td>
<td>PJ leakage, peritonitis</td>
<td>16</td>
<td>Chronic enterocutaneous fistula of GJ (alive)</td>
</tr>
<tr>
<td>2/M/70</td>
<td>Completion pancreatectomy, splenectomy, Mikulicz packing (6)</td>
<td>PJ leakage, peritonitis, pancreatic necrosis</td>
<td>19</td>
<td>Multivisceral failure not corrected with reintervention (early postoperative death)</td>
</tr>
<tr>
<td>3/M/64</td>
<td>Completion pancreatectomy, splenectomy (7)</td>
<td>PJ leakage, peritonitis, pancreatitis</td>
<td>16</td>
<td>Anastomotic recurrence of colon cancer, peritoneal carcinosis (late death)</td>
</tr>
<tr>
<td>4/M/70</td>
<td>Completion pancreatectomy, splenectomy, Mikulicz packing (6)</td>
<td>PJ leakage, pancreatitis</td>
<td>28</td>
<td>Jugal necrosis + GJ leakage 1.5 mo after completion (early postoperative death)</td>
</tr>
<tr>
<td>5/M/45</td>
<td>Completion pancreatectomy, splenectomy (9)</td>
<td>PJ leakage, peritonitis, pancreatitis</td>
<td>23</td>
<td>Persistent sepsis, recovery from MOF, local recurrence 1 y later (late death)</td>
</tr>
<tr>
<td>6/M/66</td>
<td>Completion pancreatectomy, splenic preservation (2)</td>
<td>PJ leakage, peritonitis, pancreatitis</td>
<td>12</td>
<td>Splenic vein bleeding and GJ + HJ leakage (early postoperative death)</td>
</tr>
<tr>
<td>7/F/46</td>
<td>Completion pancreatectomy, splenectomy (3)</td>
<td>PJ leakage, peritonitis, pancreatitis, pancreatic necrosis</td>
<td>18</td>
<td>Alive</td>
</tr>
<tr>
<td>8/M/53†</td>
<td>Completion pancreatectomy, splenic preservation, biliary intubation, Mikulicz packing (3)</td>
<td>Peritonitis, PJ leakage, HJ leakage, pancreatic necrosis</td>
<td>17</td>
<td>Biliary refection (alive)</td>
</tr>
</tbody>
</table>

**Abbreviations:** APACHE, Acute Physiology and Chronic Health Evaluation; GJ, gastrojejunostomy; HJ, hepaticojejunostomy; MOF, multiorgan failure; PJ, pancreaticojejunostomy.

*This patient was referred to our institution.

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operative peritonitis is further justified by the high mortality rates reported in series focused on the subject, which average 50%, well above the usual mortality rate associated with primary peritonitis, which averages 20%. In our series, the early death rate was 38%.

Postoperative leakage from the upper gastrointestinal tract associated with peritonitis represents a specific technical challenge to the surgeon, as exteriorization of the source of infection is impossible. Other series have published the outcome of completion pancreatectomy. Van Berge Henegouwen et al compared the outcomes of percutaneous drainage and completion pancreatectomy. The group of patients undergoing completion pancreatectomy showed fewer relaparotomies, less mortality, and a shorter hospital stay. However, in this series, most of the patients were reoperated on for persistent pancreatic fistula, without peritonitis. Farley et al. in their series of 17 patients mainly reoperated on for postoperative complications, pointed out the necessity for completion pancreatectomy when operative findings are irreparable pancreatic anastomotic dehiscence with extended sepsis or severe pancreatitis.

Reoperation was not delayed in our series; patients were reoperated on a mean of 5.8 days after pancreaticoduodenectomy. Smith et al. reported in a selected group of patients with postoperative complications that delayed reexploration with possible completion pancreatectomy can lead to death. Seven (64%) of their 11 patients reoperated on a mean of 18 days after Whipple resection died. The authors suspected that reoperation came too late in patients with systemic manifestations.

Splenic preservation was performed in 2 patients in our series. Our aim was to reduce the space left after completion pancreatectomy and splenectomy, not to reduce the risk of overwhelming postsplenectomy infection. However, as one of our patients died of splenic vein erosion after splenic preservation, we decided to not preserve the spleen in subsequent patients.

Induced diabetes after completion pancreatectomy is unstable, with frequent, severe, potentially lethal hypoglycemic events and low need for insulin. In our series, none of the patients died of severe hypoglycemia, but one of them had a coma with neurologic sequelae.

In conclusion, postoperative peritonitis after pancreaticoduodenectomy is a major complication associated with a high mortality rate. However, completion pancreatectomy is probably the only surgical option available to control the source of infection.

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REFERENCES