Reoperation for Severe Pancreatitis

A 10-Year Experience in a Tertiary Care Center

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Objectives: To analyze the specific problems encountered in treating patients previously operated on for necrotizing pancreatitis and to determine the benefit of such a complex and demanding procedure.

Design and Setting: Review of a case series in an academic tertiary care referral center.

Patients: Forty-four consecutive patients referred and reoperated on in 10 years.

Interventions: Retractive laparotomy with complete debridement of all necrotic sites, followed by Mikulicz packing. Mikulicz packs were replaced by removable drains allowing both local prolonged lavage and open drainage of large solid necrotic debris. Enteral nutrition was performed through a feeding jejunostomy. Associated gastrointestinal tract lesions were simultaneously treated.

Main Outcome Measures: Operative findings, bacteriological status of necrosis, in-hospital mortality, length of hospitalization, and surgical complications and their management.

Results: Necrosis was infected in 36 (82%) of the 44 cases and associated gastrointestinal tract lesions were found in 20 (45%) of these patients. Mortality was 23%, and was significantly (P = .03) related to the preoperative clinical status. Surgical complications occurred in 31 (70%) of the 44 patients necessitating surgical treatment in 18 (41%) of these patients. Mean (± SD) stay in the intensive care unit was 66 ± 8 days for survivors.

Conclusion: This complex and demanding surgical procedure is worthwhile, yielding mortality rates comparable to those observed in de novo severe necrotizing pancreatitis.

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The reported mortality rates of severe necrotizing pancreatitis in surgical series still vary today from 8% to 35% despite improvements in intensive care management and imaging techniques.1-4 Surgical treatment by necrosectomy followed by either local lavage or scheduled relaparotomy has reduced mortality compared with pancreatic resection.2 The benefit of these complex surgical procedures is accepted in patients of necrotizing pancreatitis with infection but remains debatable in patients of sterile necrosis.5-7 Today, tertiary care centers frequently are asked to manage patients operated on elsewhere and referred because of deterioration of clinical status. Numerous series including only a few transferred and reoperated on patients reported higher mortality rates than those observed in “first-hand pancreatitis.”5,8,9 To our knowledge, there is no large study to date specifically devoted to this subgroup of patients. Therefore, we have reviewed our experience in the last decade in the management of those patients previously operated on elsewhere, transferred, and then reoperated on in our center, using an original procedure combining necrosectomy, open drainage, and prolonged lavage. The aims of this retrospective work were to analyze the specific problems encountered in treating these patients and to determine the benefit of such a complex and demanding procedure.

See Invited Critique at end of article

On admission to our intensive care unit, 41 patients (93%) received intravenous antibiotics. Peripheral bacteriological samples (drainages or blood cultures) were positive...
PATIENTS AND METHODS

From 1986 to 1996, 44 patients with acute pancreatitis previously operated on elsewhere were secondarily referred for clinical deterioration and reoperated on in our unit, using a standardized technique of necrosectomy and drainage followed by continuous irrigation.

This study group consisted of 27 men and 17 women, with a mean (± SD) age of 47 ± 13 years. Acute pancreatitis was due to gallstones in 20 patients, alcohol in 8 patients, abdominal trauma in 6 patients, hypertriglyceridemia in 3 patients, endoscopic sphincterotomy in 1 patient, and idiopathic in 6 patients.

At the initial center, the diagnosis of acute pancreatitis was suspected in only 20 (45%) of the 44 patients before surgery. Ranson score was never assessed properly in the first 48 hours of admission. Acute pancreatitis was confirmed or diagnosed intraoperatively in all patients with necrosis noted in 31 patients (70%). Necrosectomy was performed in 13 patients and 2 patients underwent distal pancreatectomy. Peripancreatic drainage was performed using rubber drains in 27 patients. No patient underwent continuous irrigation of the pancreatic bed. Bacteriological analysis of pancreatic necrosis was unavailable retrospectively in most cases.

Patients were referred to our center with a mean (± SD) delay of 21 ± 14 days after the onset of the pancreatitis. Bacteriological analysis of drained fluids and blood cultures were systematically performed on admission to our intensive care unit.

Abdominal computed tomographic (CT) scan with bolus intravenous infusion of contrast material was performed if the patient's clinical status allowed this examination. Lesions were classified according to the Balthazar scoring system.9,10 There was no attempt at percutaneous puncture or drainage of the fluid collections found on CT scans.

Reoperations were decided on either because of a surgical complication of the first procedure (viscerectomy, undrained gastrointestinal (GI) tract fistula, or hemorrhage), or because of clinical deterioration with a septic course and evidence of organ failure (hemodynamic shock, acute respiratory distress syndrome, or renal insufficiency) persisting after 48 hours of maximal intensive supporting therapy.

Continuous enteral nutrition was started as soon as postoperative ileus resolved. Mikulicz gauze packs were removed at the 14th day, leaving large channels giving access to the necrotic sites, into which large bore (36F catheter) 3-channeled soft silicon spiral drains14 (Figure 1 and Figure 2) were inserted. A continuous irrigation with 2 L/d of dialysate added with 20 mL of povidone-iodine per liter of dialysate (Betadine; Asta Medica Laboratory, Merignac, France) and 50 000 UI/L of aprotinin (Trasylo; Bayer Pharma Laboratory, Puteaux, France) was immediately started through these drains. They were temporarily removed daily by the nursing staff for at least 3 weeks to perform local lavage with dialysate under pressure, to dislodge large solid necrotic debris. Antibiotics were adapted to the bacteriological analysis of the necrosis. Somatostatin analogues were not used in these patients.

Numeric results are expressed as mean ± SD. Statistical analysis was performed using the χ2 test with Yates correction and the Student t test where appropriate.
Ten patients died postoperatively after a median delay of 48 days (range, 6-250 days), accounting for a mortality rate of 23%. Causes of death were 5 multiple organ failures, 2 nosocomial pneumonias, 1 massive hematemesis, 1 cerebral stroke, and 1 pulmonary embolism. Age, sex ratio, delay of reoperation, bacteriological status of necrosis and associated GI tract lesions did not differ between survivors and nonsurvivors. The SAPS calculated prior to reoperation was significantly higher in patients who ultimately died (SAPS, 10.6 ± 4.2 vs 7.8 ± 3.4; P = .03).

Continuous enteral nutrition was started after a delay of 11 ± 1 days and was used during 56 ± 5 days. Continuous irrigation and drainage were maintained to ensure complete evacuation of necrotic debris over 40 ± 6 days. Mechanical ventilation was used for 14 ± 2 days. Forty-one surgical complications affected 31 patients (70%) during postoperative course and were treated either medically or with an iterative surgical procedure (18 patients) (Table 2). Pancreatic and GI tract fistulae were the most frequent complications affecting 10 and 7 patients, respectively. One gastric fistula occurred and was due to the reopening of a previous gastric fistula, present and sutured at first reoperation performed in our center. The remaining 6 GI tract fistulae occurred de novo. Iterative necrotic undrained collection justified a second surgical drainage in only 6 patients. No patient required more than 2 surgical drainages. The mean stay in the intensive care unit was 66 ± 8 days for survivors. Continuity of the GI tract was restored in all survivors. In 8 patients abdominal wall hernia causing esthetic or functional discomfort has necessitated delayed reparative surgery.

**COMMENT**

This case series demonstrates the value of a formal reoperation combining necrosectomy, prolonged irrigation of the pancreatic bed with active debridement of necrosis for patients previously operated on for severe acute pancreatitis and referred in a specialized center for clinical deterioration. Indeed, despite higher rates of superinfection of undrained necrosis and associated GI tract lesions than observed in de novo severe pancreatitis, this procedure yields a 23% in-hospital mortality rate comparable to that reported by specialized surgical teams for patients without operative intervention.4,6,16
Prognostic scores commonly used for acute pancreatitis include data collected in the first 48 hour of first admission. These scores were therefore unsuitable for these reoperated on patients. The SAPS, which prognostic value has been established for de novo pancreatitis, seems of comparable prognostic value for these reoperated on patients when it is calculated in the 12 hours prior to reoperation. Its high mean value reflects the severity of pancreatitis in this series. Most patients were reoperated on because of severe clinical deterioration occurring despite appropriate intensive supportive treatment. We did not preoperatively assess the bacteriological status of necrosis by percutaneous CT-guided fine needle aspiration. This strategy could be criticized by those operating exclusively infected necrosis, but the mortality of severe necrotizing pancreatitis even with sterile necrosis can reach 38%. Moreover, the bacteriological status of the necrosis has no significant influence on the outcome for patients operated on after the third week of evolution of the pancreatitis and the surgical debridement of symptomatic necrosis seems beneficial irrespective of its bacteriological status. Lastly, infection of necrosis was actually present in most patients, probably favoring by previous inadequate prolonged surgical drainage.

A poor correlation was found between CT scan and either extra pancreatic necrosis or outcome, consistent with previous findings. Gas bubbles within necrosis were not reliably attributable to infection in these operated on patients because of previously placed abdominal drains. We did not use the CT-guided percutaneous drainage of necrotic collections because of poor results in pancreatitis, attributable to their inability to drain large solid necrotic debris. Since our surgical procedure systematically explores all potential sites of necrotic collections, CT scan was not obtained in hemodynamically unstable patients before reoperation. The transperitoneal route was preferred to the retroperitoneal approach recently promoted, combining the advantages of techniques of repeated drainage of necrotic collections because of poor results and the prophylactic use of somatostatin analogues may reduce the incidence of late pseudocyst observed in this series compared favorably with previous reports, and reflects the efficiency of this drainage procedure.

The 6 de novo GI tract fistulae (14%) observed during the postoperative course were attributable either to the necrotizing process or more likely to GI tract traumatism by the removal of the Mikulicz gauze packs or by iterative mobilization of the spiral drains. These fistulae are, however, also observed with other techniques. They could be well drained and irrigated by the spiral drains and were closed by delayed simple surgery. Pancreatic fistulae were the most frequent complication but closed spontaneously in 60% of cases. They constitute probably the unavoidable drawback of an efficient necrosectomy and drainage procedure and are observed with comparable frequency by several teams, no matter what surgical technique is used. The prophylactic use of somatostatin analogues may reduce the incidence of these pancreatic fistulae or favor a spontaneous closure.

Mortality of patients transferred from other units for severe acute pancreatitis has been reported to be greater than for direct admission in a specialized unit and to reach 35% to 75%. Contrary to these previous reports including only a few patients operated on, transferred, and reoperated on in specialized centers, the 23% mor-

### Table 1. Bacteriological Analysis of Necrosis Collected Before Reoperation*

<table>
<thead>
<tr>
<th>Gram Staining</th>
<th>Microorganisms</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gram-positive</td>
<td>Staphylococcus coagulase-positive</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus coagulase-negative</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Enterococcus species</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Escherichia coli</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Proteus mirabilis</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Klebsiella oxytoca</td>
<td>5</td>
</tr>
<tr>
<td>Gram-negative</td>
<td>Enterobacter species</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Serratia species</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pseudomonas aeruginosa</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Acinetobacter species</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Xanthomonas maltophilia</td>
<td>1</td>
</tr>
<tr>
<td>Anaerobes</td>
<td>Bacteroides fragilis</td>
<td>2</td>
</tr>
<tr>
<td>Fungi</td>
<td>Candida albicans</td>
<td>4</td>
</tr>
</tbody>
</table>

*A single species of microorganism was present in 17 patients, 2 different species were present in 12 patients, and 3 different species were found in 7 patients. Cultures were sterile for 8 patients.

### Table 2. Complications Following Reoperation and Their Treatments

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. (%) of Patients</th>
<th>Duration of Treatment, d</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undrained necrotic collection</td>
<td>6 (14)</td>
<td>5-82</td>
<td>Surgical drainage</td>
</tr>
<tr>
<td>Pseudocyst</td>
<td>2 (4)</td>
<td>65-74</td>
<td>Enterocystostomy</td>
</tr>
<tr>
<td>Pancreatic fistula</td>
<td>10 (23)</td>
<td>3-195</td>
<td>Distal pancreatectomy (n = 4)</td>
</tr>
<tr>
<td>GI tract fistula*</td>
<td>7 (16)</td>
<td>3-30</td>
<td>Delayed surgery (n = 6)</td>
</tr>
<tr>
<td>Biliary fistula</td>
<td>1 (2)</td>
<td>14</td>
<td>Spontaneous closure (n = 1)</td>
</tr>
<tr>
<td>Evisceration</td>
<td>1 (2)</td>
<td>1</td>
<td>Spontaneous closure</td>
</tr>
<tr>
<td>Upper GI tract bleeding</td>
<td>6 (14)</td>
<td>2-75</td>
<td>Antisecretory drugs and endoscopic sclerosis</td>
</tr>
</tbody>
</table>

*Involving the stomach (1 patient with reopening of a gastric fistula sutured at the initial reoperation), the duodenum (1 patient), the small bowel (2 patients), and the colon (3 patients without diverting ileostomy). GI indicates gastrointestinal.

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tality rate observed in this series is comparable to the mor-
tality rates reported by us and others3,6,12,20,23,35 for de novo
necrotizing pancreatitis. The efficiency of our operative
approach may be responsible for this difference. Its re-
sults argue for the early transfer of such patients in
specialized centers and justify this complex and demand-
ing treatment.36

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The preceding article from our French colleagues focuses on a difficult subgroup of patients with necrotizing pancreatitis in whom an initial surgical exploration failed to control sepsis. Their reoperative approach consisted of extensive debridement of residual necrosis, exteriorized Mikulicz packs, feeding jejunostomy, biliary drainage, and loop ileostomy whenever colon viability was problematic. After 2 weeks, packs were replaced with proprietary silicon drains, which were exchanged daily and continuously irrigated. Since this approach is essentially a modification of lesser sac lavage, it is not surprising that their 23% mortality rate is comparable to traditional lesser sac lavage. Several comments are in order. Infected pancreatic necrosis was present in 82% of these previously surgically explored patients, a significantly greater incidence of infected necrosis than the 20% incidence of infected necrosis in unoperated necrotizing pancreatitis. Surgically induced secondary infection of sterile pancreatic necrosis is a real risk and results in measurable escalation of mortality. When combined with prospective observations that neither mortality nor morbidity is improved by surgical debridement when compared with supportive therapy, the rationale for surgical intervention in sterile necrotizing pancreatitis is, at best, unclear.

From a technical standpoint, the somewhat higher rate of fistula formation in the current series (14%) may have arisen from repetitive tube exchanges. Moreover, the 43% incidence of loop ileostomy in this report may have been the price paid by Paye et al to avoid determination of colonic viability by scheduled surgical reexplorations. Unfortunately, no justification was offered for programmatic biliary drainage by cholecystostomy or choledochotomy, procedures largely abandoned in other pancreatic centers. Despite these minor misgivings, Paye et al are to be congratulated for their excellent results in these salvage cases, results that speak eloquently not only for the skill and dedication of their pancreatic team, but also for early referral of patients with necrotizing pancreatitis to centers of excellence.

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ARCHIVES OF INTERNAL MEDICINE

The Clinical Diagnosis of Deep Venous Thrombosis
Susan R. Kahn, MD, MSc

Symptoms and clinical signs suggestive of deep venous thrombosis (DVT) are common and have numerous possible causes. Studies have shown that symptoms and clinical signs in themselves are inaccurate for the diagnosis of DVT. However, clinicians have other information at hand, such as data on risk factors for DVT, that may help improve their ability to predict a diagnosis of DVT in the individual patient. Epidemiological data on DVT incidence and risk factors were reviewed, as were published data on the accuracy of clinical diagnosis of DVT, with the use of both symptoms and signs in isolation and symptoms and signs combined with other clinical information in the form of clinical prediction indexes. Symptoms and clinical signs, when combined with other patient information such as the presence or absence of known risk factors for DVT, can improve clinical prediction considerably. Further study is needed to determine whether clinical prediction indexes have a role in improving the diagnostic process in patients with suspected DVT. (1998;158:2315-2323)

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