Basic Chapter 20

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20.1 Relevant Basic Information, Indication, and Contraindication

Severe pancreatitis complicates about 15–20 % of all cases of acute pancreatitis.

The diagnosis of acute pancreatitis is based on the classic clinical features (abdominal pain, vomiting) and evaluation of lipase or pancreatic amylase in the plasma (Table 20.1). We prefer the use of lipase levels because of the longer half-life and slightly superior sensitivity and specificity. Ultrasonography may show pancreatic swelling, but bowel gas can prevent adequate visibility of the pancreas during the ultrasound procedure. Ultrasonography can also show gallbladder stones or dilation of the bile duct as a sign of stones in the bile duct. A plain abdominal x-ray should be obtained to exclude free abdominal air because the differential diagnosis of acute pancreatitis is broad and includes other abdominal emergencies such as a perforated peptic ulcer. Imaging by contrast-enhanced computed tomography (CT) provides

Table 20.1 Diagnostic in patients with suspicion of acute pancreatitis

Diagnostic methods	Questions
Clinic	Jaundice, pain, vomiting
Laboratory evaluation	Standard parameters, lipase, CRP, procalcitonin
Standard chest X-ray	Pulmonary lesions, pneumonia, pleural effusion
Plain abdominal x-ray	Exclusion of visceral perforation (free abdominal air), not needed if early CT is performed
Ultrasonography	Swelling of the pancreas if pancreas is visible, gallbladder stones, or dilation of the bile duct (gallstone history of the acute pancreatitis?), not needed if early CT is performed
CT (contrast-enhanced CT) initial assessment	Acute pancreatitis, bile duct obstruction, free intraperitoneal fluid, peripancreatic fat necrosis, indication of prophylactic antibiotics (early CT may underestimate the ultimate severity of pancreatitis)
CT (contrast-enhanced CT) follow up (not before 4 days after onset of pancreatitis	Determination and localization of necrosis, abscess, pseudocyst, change in the local situation
ERCP	*Verification and removing of bile duct stones*
MRI	*Optional in children or pregnant patients*

Italic – optional tests for specification of the diagnosis

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the best evidence for the presence of acute pancreatitis and is better able to rule out other causes of the abdominal pain (initial CT assessment). C-Reactive Protein (CRP) levels over 150 mg/l, an APACHE II score greater than 8 in the first 24 h after admission, or persistent organ failure in the first 48 h after admission are established, clinically useful predictors of the severity of acute pancreatitis. Patients with severe acute pancreatitis should be admitted to an intensive care unit for optimal support. A determination of the amount of pancreatic necrosis by contrast-enhanced CT is usually possible 4 or 5 days after the onset of acute pancreatitis. Patients with sepsis, organ failure, or a worsening clinical status require urgent contrast-enhanced CT for determination of the local extent of necrosis or local complications. Both oral and intravenous administration of a contrast agent is necessary. If there is any evidence of a gallstone in the bile duct, urgent endoscopic retrograde cholangiography should be done with endoscopic sphincterotomy and stone removal.

After the diagnosis of necrosis is made based on CT, antibiotic prophylaxis is started.

The use of prophylactic antibiotics is still a matter of debate. Some guidelines have already rejected this recommendation, because several relevant prospective studies with high evidence failed to show a positive effect on mortality. The rationale for use of prophylactic antibiotics was suggested based on some older studies with a lower grade of evidence. A Cochrane meta-analysis in 2006 described a reduction in mortality using prophylactic antibiotics in necrotizing pancreatitis (5 studies, 294 randomized patients, 6 vs. 15 % mortality). For these reasons, the use of prophylactic antibiotics remains a viable option to us. We limit the use of antibiotic prophylaxis to a maximum of 14 days.

The management of acute necrotizing pancreatitis has changed substantially in the last several years. Early management is supportive and nonsurgical. Most patients with acute necrotizing pancreatitis survive the early phase of this disease (Systemic Inflammatory Response Syndrome, SIRS) due to improvements in intensive care medicine. Severe pancreatitis is usually associated with organ failure and local complications like infected necrosis or abscess formation and later sepsis. Early operative intervention (before the third to fourth week after the onset of illness) or the operative treatment of sterile necrosis should be reserved for select cases. Infection of the pancreatic necrosis is a well-accepted indication for operative intervention. Infected pancreatic necrosis can be the focus of a severe sepsis and is associated with a high mortality. The development of infected necrosis is the rationale of pancreatic surgery in acute necrotizing pancreatitis. In contrast, infected necrosis does not mandate operative treatment in every case. Focused antibiotic therapy combined with a local percutaneous drainage can cure some patients with stable, localized disease (Fig. 20.1).

Pancreatic necrosis is usually well demarked after about 3 weeks from the onset of acute pancreatitis. Removing only the well-demarked necrosis (focal necrosectomy) reduces the risk of bleeding and preserves the still vital pancreatic parenchyma. There is general agreement between surgeons that early operative intervention (necrosectomy) should be done only in select cases, for instance, when there are severe complications (bleeding, bowel perforation) or in severe critically ill patients with proven necrosis. Patients who present with signs of sepsis can undergo CT guided fine needle aspiration of pancreatic or peripancreatic necrosis to differentiate between sterile and infected necrosis. Furthermore, the CT findings of extraluminal gas within areas of necrosis is pathognomonic of infection. Persistent necrotic pancreatitis with a fulminate course can also, in selected cases, be an indication for operative intervention (necrosectomy). The surgeon will usually see only a select group of patients with acute pancreatitis (unstable patients with septic focus and multiple organ failure). For that reason, the indication for necrosectomy is often quite clear. The surgeon has now to determine the best time for operative intervention in concordance with the intensive care specialist.

20.2 Surgical Technique

Manual necrosectomy and continuous lavage is our preferred operating technique. The operation begins with a bilateral subcostal incision in the upper abdomen (Fig. 20.2). We use a self-retaining retraction system for the costal rim. This approach allows the greatest exposure to the area of interest. An inspection of the lower abdomen

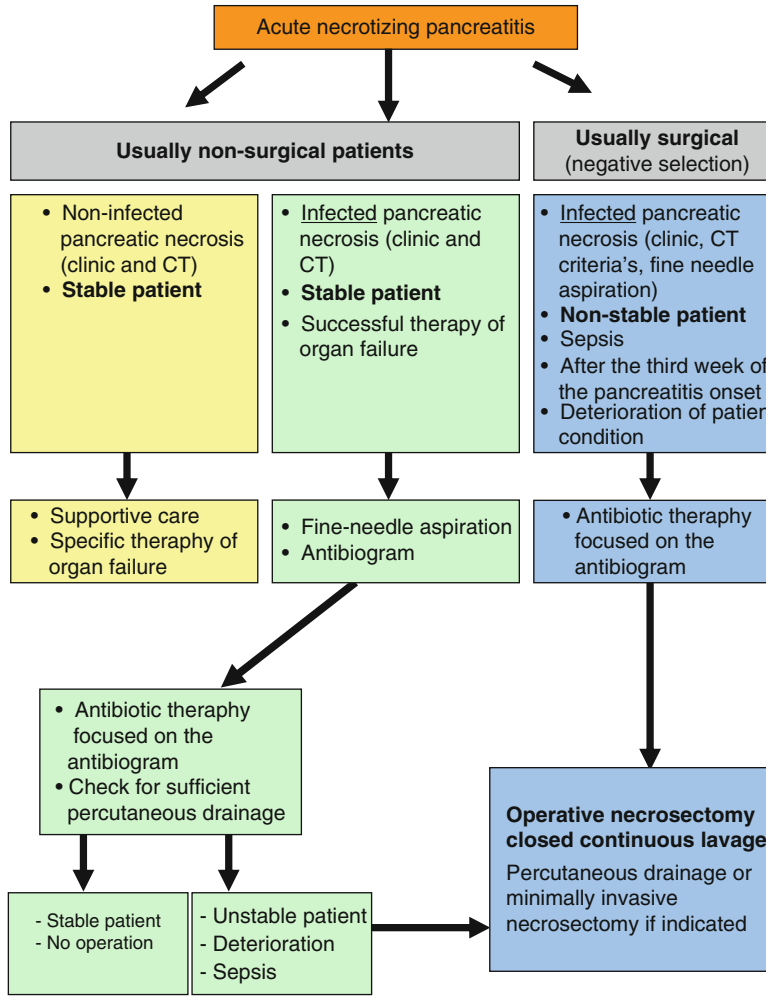

Fig. 20.1 Therapeutic flow in acute necrotizing pancreatitis

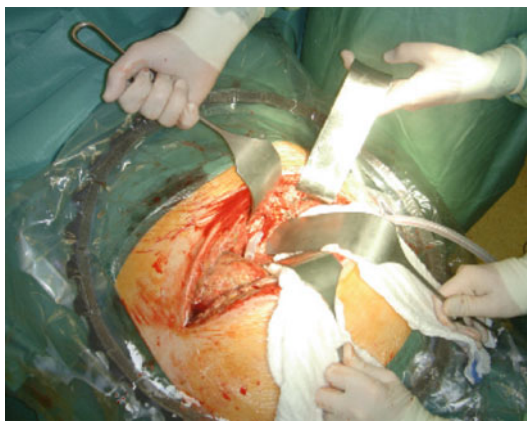

Fig. 20.2 A bilateral subcostal incision was done for a wide approach to the lesser sac. A special lavage fluid bag (Incise Pouch®, Moelnlycke Health Care AB, Göteborg, Sweden) is used for collecting the lavage and irrigation fluids

or a loop ileostomy is also possible if necessary using this approach.

The middle and the left half of the gastrocolic ligament is divided between sutures or using the harmonic scalpel (Generator 300, Ethicon Endo-Surgery, Johnson & Johnson, Somerville, USA). Edema and local fat necrosis with calcifications are often present in this region of the greater omentum at this step of the operation (Fig. 20.3). The greater omentum and transverse colon provide a natural barrier to the lower abdomen. Blunt dissection mobilizes the stomach off the transverse colon and off the anterior surface of the pancreatic body and tail (Figs. 20.3 and 20.4). The best way to avoid bleeding while removing viable pancreatic tissue is to use the fingers for preparation. The preparation is aided by repeated lavage of the lesser sac with warm isotonic saline

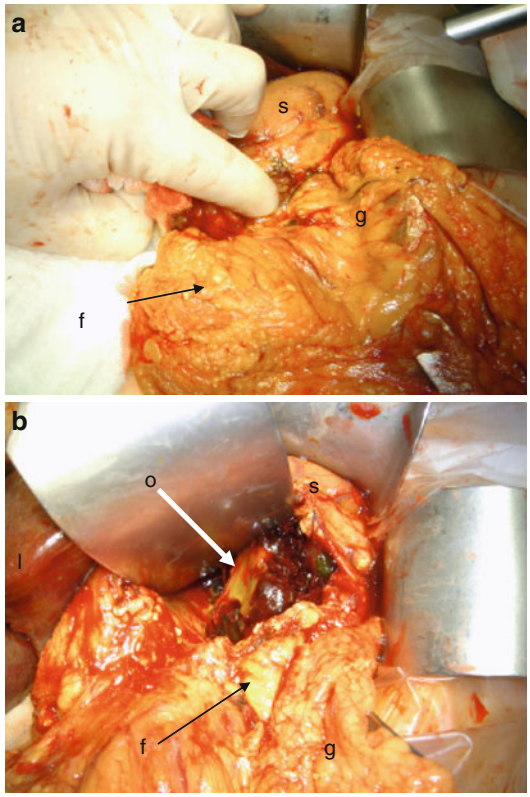

Fig. 20.3 (**a**, **b**) View into the incompletely opened lesser sac through the gastrocolic ligament (*s* stomach, *g* greater omentum, *f* fat necrosis, *o* open lesser sac with coagulated blood and necrotic material, *l* liver)

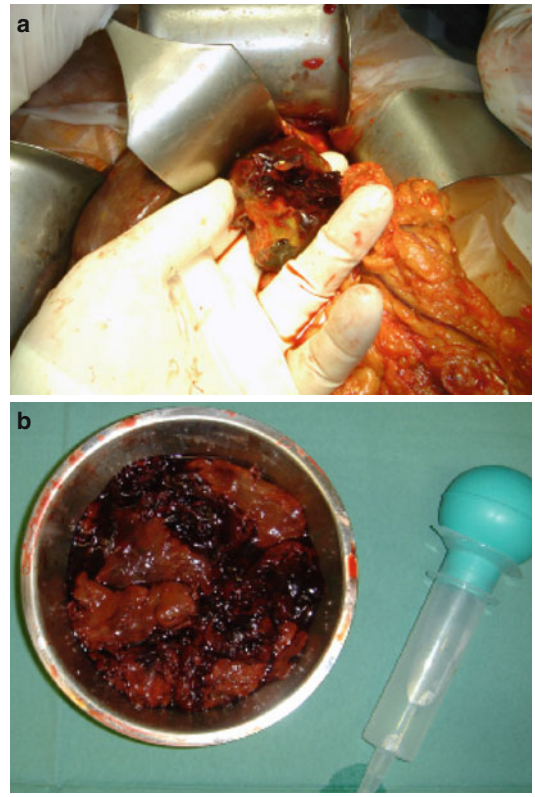

Fig. 20.4 (**a**, **b**) The character of necrotic pancreatic and peripancreatic tissue and coagulated blood removed. Necrosectomy is performed bluntly using the fingers (digitoclastic necrosectomy)

fluid. Coagulated blood, peripancreatic necrosis, and areas of pancreatic necrosis that have been separated from underlying viable pancreatic parenchyma or areas of necrosis are removed by this maneuver (Fig. 20.4). Necrotic debris that is adherent and cannot be teased free with gently exploring fingers should be left in place to avoid bleeding. Necrotic material needs to be sent to a laboratory for culture and sensitivity. Experience operating in this area in elective cases greatly helps one perform the necessary technical maneuvers and to understand the relevant anatomy to allow a safe necrosectomy. Computed tomography is used for guiding the procedure. Necrosis usually extends into the retroperitoneal area behind the splenic flexure and anterior to the left kidney. It is important to débride and drain this area, too.

Usually we prefer a continuous lavage of the lesser sac and retroperitoneum postoperatively via operatively placed drains. If areas of hemorrhage persist after the necrosectomy, temporary packing with operative dressings for 48 h is useful if control of the bleeding using bipolar forceps or sutures fail.

If no clinically significant bleeding is evident at the end of the necrosectomy, a large-bore silicon drain (30–36 French, Robinson Drainage System, Smith Medical, Kirchseeon, Germany) is placed in the pancreatic bed for the outflow of the continuous lavage. This drain tube is placed in the lesser sac and exits the abdomen by going posterior to the splenic flexure and anterior to the left kidney across the retroperitoneal perirenal space and exiting through a stab wound in the left lateral abdomen (Fig. 20.5). Dissecting this space behind the splenic flexure can be difficult; mobilization of the left colon in the area of the kidney and a bimanual digital technique can be useful in this situation. On the other hand, radiologic

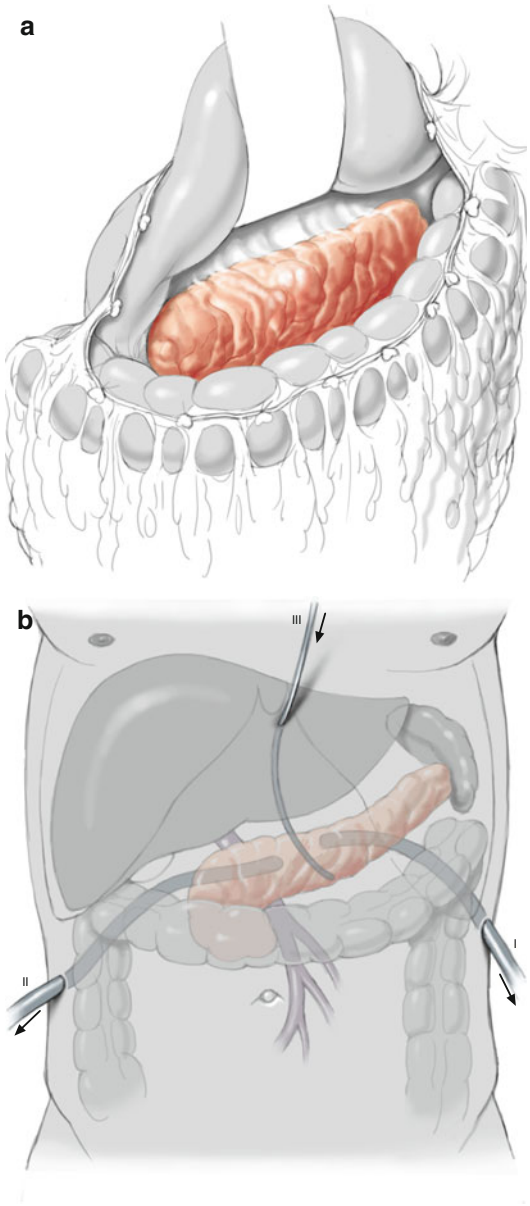

Fig. 20.5 (**a**) Exposure of the lesser sac by transecting the gastrocolic ligament and (**b**) position of drains for a continuous lavage. *I* left large silicone drain (36 French) behind the left colon splenic flexure, *II* optional right large silicone drain (36 French), *III* silicone inflow drain (12 French)

placement of a small percutaneous pigtail catheter preoperatively can make this procedure much easier.

Only in the case of extended necrosis in the pancreatic head, do we use a second large outflow drain placed subhepatically through the Foramen Winslowi into the lesser sac and brought

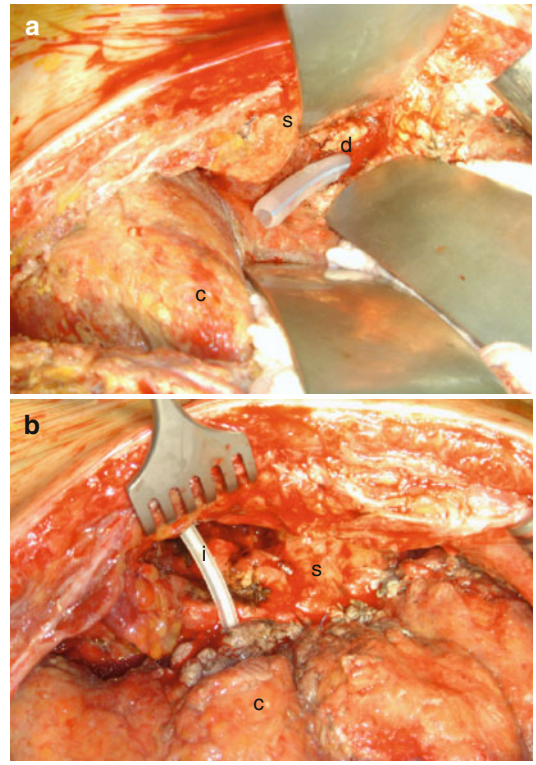

Fig. 20.6 (**a**, **b**) View into the lesser sac with large drainage tube with closure of the gastrocolic ligament with a silicone inflow drain (*d* outflow drain, *i* inflow drain, *s* stomach, *c* transverse colon)

out through a stab wound in the right lateral abdomen.

A smaller inflow catheter (12 French silicone gastric tube, VYGON, Ecouen France) is placed through the epigastric area into the opened lesser sac. The positioning of the drains for continuous lavage is very important (Fig. 20.5).

Function of the confirmed drains for continuous lavage should be confirmed before the abdomen is closed. If possible, the gastrocolic ligament is reapproximated with interrupted sutures (Vicryl® 2/0, Ethicon, Johnson & Johnson, Somerville, USA) (Fig. 20.6). If a gallstone etiology is evident, we remove the gallbladder during the procedure. The abdominal wound is closed with two continuous layers of an absorbable monofilament suture (PDS I® 2, Ethicon, Johnson & Johnson, Somerville, USA), one for the peritoneum and posterior rectus fascia and the other for the anterior rectus fascia. Postoperatively, a continuous lavage is performed with a standard

peritoneal dialysis fluid (CAPD, Fresenius Medical Care AG & Co. KGaA, Bad Homburg, Germany) at a rate of 0.5 l/h. The lavage volume can be decreased depending on the appearance of the effluent and the clinical course. Usually drains can be removed within 2–3 weeks.

Some groups utilize radiologic percutaneous drainage or laparoscopic or endoscopic techniques to remove infected necrosis from the pancreatic area (minimally invasive necrosectomy). These methods seem to be most successful in cases with well-circumscribed necrosis containing a large fluid component. Repeated interventions form very talented and experienced surgeons are usually necessary in these cases to remove necrotic tissue. We believe that it is difficult to remove all infected pancreatic, peripancreatic, and retroperitoneal necrosis and associated inflammatory fluids by these techniques alone, but retroperitoneal endoscopic or endoscopic transgastric procedures are interesting methods and should be investigated further using randomized trials. At this time, minimally invasive necrosectomy is far from the standard practice in treating many patients requiring necrosectomy for acute necrotizing pancreatitis.

20.3 Additional Treatments and Procedures

- ICU admission with invasive monitoring and laboratory analysis are routine in patients with severe acute pancreatitis.
- Adequate fluid resuscitation monitored using the central venous pressure and urine output is standard therapy.
- Oxygen saturation (mask).
- All patients with severe necrotizing pancreatitis get prophylactic antibiotics (3×1 g Imipenem, Zienam®, MSD Sharp & Dohme GMBH, Haar, Germany) for 14 days.
- All patients get prophylaxis against deep vein thrombosis with low molecular weight heparin (0.3 ml Certoparin-Natrium, Mono-Embolex™, Novartis Pharma, Nuernberg, Germany) once daily started at admission until discharge. Prophylaxis against gastric stress ulcer is done with 40 mg pantoprazole daily intravenous (Pantozol®, Atlanta Pharma, Konstanz, Germany).
- If technically possible, all patients get an epidural catheter for pain management.
- All patients get a double lumen gastric/jejunal tube. The end of the tube is placed into the jejunum for enteral nutrition without direct passage of the stomach and duodenum. Oral water or tea are possible. Ileus or shock may limit the use of enteral nutrition. Nasogastric feeding may limit the use of enteral nutrition. Nasogastric feeding with limited volume is also possible in many patients. The continuous lavage usually continues for about 2 weeks, depending on the quality of the outflow fluid and the clinical course. Usually, drains can be removed within 2–3 weeks.

20.4 Results

Table 20.2 contains the relationship between patients treated in the surgical department in contrast to patients treated in other departments in 2006 and 2007. Only 1.3 % of all patients with the diagnosis of acute pancreatitis underwent operative intervention (necrosectomy). These data show impressively the decreased role of operative necrosectomy in the treatment of acute pancreatitis. The surgeons usually see a negative selection of patients who have failed conservative therapy.

The surgical results of our institution are contained in Table 20.3.

Table 20.2 Patients with acute pancreatitis treated at the university hospital in Magdeburg with acute pancreatitis in 2006 and 2007 (ICD 10 confirmed analysis)

Patients at the hospital	Patients in surgical department	Patients in surgical department and surgery of necrosis
461	49 (10.6 %)	6 (1.3 %)

Table 20.3 Patients with severe acute necrotizing pancreatitis from 2006 to 2007 surgically treated (surgical necrosectomy)

	Number
Patients	6
Hospital mortality	1
Hospital stay (median, days)	63 (16–378)
Biliary history	3
Alcoholic history	2
Other history	1
Microbiological proven infected necrosis	5
Closed continuous lavage	6
Open packing	–
Planned staged relaparotomy with repeated lavage	–
Closed packing (multiple drains + transcutaneous gauze)	–