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Pancreatic Head Mass: How Can We Treat It?
Acute Pancreatitis: Surgical Treatment

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Acute pancreatitis is an inflammatory process of variable severity, ranging from a mild, self-limited form with interstitial edema of the pancreas to a severe form with extensive pancreatic necrosis and hemorrhage [1-3]. Pancreatic necrosis combined with septic conditions is the leading cause of mortality in acute pancreatitis. Although aggressive organ-system support has resulted in an improved survival rate in the early stage of the disease, patients continue to die at a later stage from septic complications, culminating in multiorgan failure [4]. Overall infection rates in acute pancreatitis do not exceed 10%, but infected necrosis occurs in up to 70% of patients with necrotizing pancreatitis [5-7]. The reported mortality rate of these complications ranges from 15 to 80% [5 ,6, 8, 9]. It is generally accepted that the initial treatment of acute pancreatitis should be conservative unless there is a specific indication for surgical intervention. There are, however a number of clear-cut indications for which surgery should be performed: 1) patients with infected necrosis should undergo urgent surgical debridement, after bacterial infection has been diagnosed; 2) ongoing multiorgan failure despite maximum intensive medical therapy over a period of 48-72 h is accepted as an indication for surgery; 3) abdominal complications (persistent ileus, intra-abdominal bleeding, suspected gastrointestinal tract perforation) pose additional indications for surgical treatment [8, 10, 11].

It has recently become apparent that there are three recognizable forms of pancreatic infection according to the morphological, clinical and laboratory criteria: infected pancreatic necrosis, a pancreatic abscess and an infected pseudocyst [6, 7, 10-15]. The incidence of pancreatic infection, including infected necrosis, pancreatic abscesses and infected pseudocysts, complicating acute pancreatitis ranges from 8% to 12% [4, 5, 8]. However infected necrosis is reported to develop in 40% to 70% of all patients with necrotizing pancreatitis [6, 7, 16] depending on the extent of the necrosis and the duration of the pancreatitis.

Diagnosis

The basis of appropriate treatment of infected pancreatic necrosis is an early, accurate diagnosis. Delayed diagnosis has been identified as a major factor resulting in poor outcome and mortality [10]. Criteria for the diagnosis of infected pancreatic necrosis include confirmation of previous or present pancreatitis, clinical evidence of sepsis, determination of the APACHE II score and the retrieval of microorganisms before and at the time of the operation. Extensive clinical experience has shown that contrast-enhanced computer tomography (CT) is the gold standard for differentiating the morphological features of the pancreas at an early or later stage of pancreatitis [17-19]. The introduction of helical CT scanners has allowed three-dimensional reconstruction of the intraabdominal viscera, and volumetric assessment of the extent of intra- and

extrapancreatic necrosis, and peripancreatic and retroperitoneal exudation. However, CT diagnosis of infection is rarely possible. A characteristic appearance, the "air bubble" phenomenon produced by gas-forming bacteria, is seen in only 20% to 55% of all patients with infected necrosis [7]. The most appropriate diagnostic method for the early detection of infected pancreatic necrosis is guided percutaneous fine-needle aspiration with Gram staining and culturing of the aspirate [19-20].

Surgical Treatment

There is general agreement that infected pancreatic necrosis is an absolute indication for surgery; non-operative or percutaneous management is usually associated with a fatal outcome. A variety of approaches have been advocated for the surgical management of infected pancreatic necrosis. They include different techniques, ranging from tissue-sparing methods to aggressive, extensive resection. During the 1980s, three main patterns of management could be identified in the surgical management of necrotic and infective complications of acute pancreatitis: 1) "conventional" treatment, including resection of the involved pancreatic tissue or necrosectomy, followed by simple drainage of the peripancreatic bed; 2) "lavage" treatment, in which necrosectomy is followed by continuous closed local irrigation or lavage of the involved pancreatic and retroperitoneal area; and 3) an "open abdominal management" (laparostomy), involving necrosectomy followed by various combinations of planned and staged reoperations. The mortality rate of the three patterns was 42% (range 24-84%) [21-23], 12.5% (range 6.3-23%) [8, 12, 24, 25] and 21% (range 11-55%) [26-28] when "conventional" treatment, "lavage" treatment and "open abdominal management" were applied, respectively.

Since 1986 we have adopted the "lavage" treatment in our practice, consisting of wide-ranging necrosectomy and other surgical interventions, combined with continuous widespread lavage [24]. In all patients (175 patients), the operative management consisted of wide-ranging necrosectomy throughout the entire area affected, using bilateral subcostal laparotomy. The abdomen was explored for classification of the extent of pancreatic and extrapancreatic necrosis. Through division of the gastrocolic and the duodenocolic ligaments, the extent of necrosis in the head, body and tail of the gland could readily be assessed and measured. For accurate exploration of the retroperitoneum, Kocher's mobilization of the duodenum and mobilization of the right and left colon were performed. In our cases, the infected necrotizing process was situated in the right and left retrocolic area in 70%, in the left subphrenic area in 20%, and in the retroduodenal and subhepatic area in 10%. Debridement or necrosectomy, either digitally or by the careful use of an instrument combined with permanent normal saline lavage, permitted the exclusive removal of all demarcated devitalized tissue, preserving the vital pancreatic tissue [25] and removing the infected necrotic tissue from the whole affected retroperitoneal area. After surgical debridement, meticulous hemostatis and extensive intraoperative lavage with 8 to 10 liters of normal saline were applied, and for postoperative closed continuous local lavage 4 to 11 large (Charr. 28-34) silicone rubber tubes were inserted into the entire area affected. They were inserted only into the pancreatic region and the retroperitoneal spaces, without any connection with the intraabdominal region.

In 79 of the 175 cases (45%) some other surgical intervention - distal pancreatic resection and splenectomy (n=30), splenectomy (n=4), subtotal pancreatectomy (n=6), colon resection (n=3), cholecystectomy (n=35), cholecystectomy and bile duct drainage (n=6), partial hepatic resection (n=1) or appendectomy (n=2) - was also performed. Continuous washing and suction drainage was applied for an average of 42.5 days (range 21-90), with a median of 9.5 liters (range 5-20) of normal saline per 24 h. In the first few

postoperative days, the amount of lavage fluid was generally 15-20 liters, which was later reduced, depending on the clinical course and on the appearance and quality of the outflowing liquid. Reoperation was necessary in 22% (38 patients) of all patients. 32 of them had developed a secondary abscess in the area of the original necrosis cavity and 2 had developed a colonic fistula, which was cured by large bowel resection, while massive diffuse local bleeding was responsible in 4 patients. Only one of the reoperated cases died following reoperation as a result of local bleeding. Pancreatic fistulas were observed in 16 patients; in 8 cases they closed spontaneously, but in the remaining 8 cases they became long-standing, high-output ones with a high amylase concentration (mean 435 500 U/L). In all 8 of these patients, octreotide therapy (3x0.1 mg/day) was combined with total parenteral nutrition, and 13 days (range 7-19) of this treatment led to complete closure of the fistulae [29]. Systemic complications occurred mainly in connection with local complications and reoperation. In 32 patients respiratory failure required mechanical ventilation for over 24 h. Renal and circulatory insufficiency developed in 10 and 5 patients, respectively.

Eleven patients died following surgery and therefore the overall mortality rate was 6.3% (11 of 175 patients). The cause of death was bacterial sepsis in 7 patients, bacterial and fungal sepsis in one patient, fungal sepsis in one patient, myocardial infarction in one, and stroke in one patient. The hospital stay of the surviving patients amounted to a median of 45 days (range 24-95).

The surgical management of our patients with infected pancreatic necrosis was directed towards removal of the devitalized intra- and extra-pancreatic tissue in all affected areas. It seems very important to explore every possibly infected site since ineffective debridement can endanger the recovery of the patients and increase the likelihood of reoperation. In agreement with several authors, it is not necessary to remove every small bit of the devitalized tissue, because any necrotic or necrotizing tissue is washed out by the lavage fluid later in the postoperative period [13, 14, 24, 25]. The success of the postoperative closed continuous lavage depends on the number and the size of the drainage tubes [30]. Generally, we applied 4 to 11 large silicone tubes inserted in all the sites affected. As infected necrotic processes can extend into intra- and extrapancreatic areas, other surgical interventions are also advisable. This fact explains our surgical strategy, namely in 79 of 175 patients (45%) the necrosectomy and continuous lavage were combined with several surgical interventions (distal pancreatic resection, splenectomy, cholecystectomy, colon resection, etc.). We attribute the improved survival rate to adequate surgical debridement and additional surgical intervention combined with continuous widespread washing and suction drainage in all affected areas. A large volume of saline solution for continuous lavage through multiple drainage tubes is a safe and non-traumatic procedure which can eliminate the infected, necrotic tissue. Effective surgical treatment together with adequate supportive therapy can give good results in patients with infected pancreatic necrosis.

In conclusion, improved results can be achieved by aggressive surgical treatment, continuous, long-standing washing and suction drainage together with supportive therapy, including immunonutrition, modification of the cytokine production [31, 32] combined with adequate antibiotic and antifungal medication [33, 34]. This surgical strategy provides the possibility of recovery in cases of necrotizing pancreatitis combined with septic complications.

Key words Candida; Glutamine; Infectious Pancreatic Necrosis Virus; Pancreatitis, Acute Necrotizing; Pentoxifylline

Abbreviations CT: computed tomography

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