

Clinical Science

# A contemporary series of patients undergoing open debridement for necrotizing pancreatitis



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specificity

## Abstract

**BACKGROUND:** For patients with acute pancreatitis complicated by infected necrosis, minimally invasive techniques have taken hold without substantial comparison with open surgery. We present a contemporary series of open necrosectomies as a benchmark for newer techniques.

**METHODS:** Using a prospective database, we retrospectively identified consecutive patients undergoing debridement for necrotizing pancreatitis (2006 to 2009). The primary endpoint was in-hospital mortality.

**RESULTS:** Sixty-eight patients underwent debridement for pancreatic/peripancreatic necrosis. In-hospital mortality was 8.8% ( $n = 6$ ). Infection ( $n = 43$ , 63%) and failure-to-thrive ( $n = 13$ , 19%) comprised the most common indications for necrosectomy. The false negative rate (FNR) for infection of percutaneous aspirate was 20.0%. Older age ( $P = .02$ ), Acute Physiology and Chronic Health Evaluation II score upon admission ( $P = .03$ ) or preoperatively ( $P < .01$ ), preoperative intensive care unit admission ( $P = .01$ ), and postoperative organ failure ( $P = .03$ ) were associated with mortality.

**CONCLUSIONS:** Open debridement for necrotizing pancreatitis results in a low mortality, providing a useful comparator for other interventions. Given the high FNR of percutaneous aspirate, debridement should not be predicated on proven infection.

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Acute pancreatitis afflicts over 200,000 people annually in the United States and its incidence appears to be increasing.<sup>1</sup> Approximately 20% of patients have disease complicated by necrosis of the pancreatic parenchyma or peripancreatic tissues<sup>2</sup> and 30% of those patients develop infected necrosis.<sup>3</sup> Without some form of intervention—surgical, endoscopic, or percutaneous radiologically guided—infected necrosis carries an extremely poor prognosis.<sup>4,5</sup> The indications, timing, and techniques for intervention have recently undergone considerable evolution.<sup>6</sup> In the past, earlier debridement, including for sterile necrosis, was commonplace. Currently, most practitioners

delay intervention until 4 weeks after the onset of disease and the only clear indication for intervention is necrotizing pancreatitis complicated by proven infected necrosis.<sup>7</sup> In addition to an evolution in indications for and timing of intervention, the interventional approach has shifted away from open surgical debridement and toward minimally invasive methods such as transgastric endoscopic debridement, percutaneous drainage, video-assisted retroperitoneal debridement (VARD), and laparoscopic necrosectomy, alone or in combination.

Although there may be advantages to these minimally invasive approaches, we have long favored open surgical debridement at our institution and have previously shown that it can be accomplished with low mortality, acceptable morbidity, and relatively short hospital stays.<sup>8</sup> Recent evolution in critical care as well as the timing and indications of surgical debridement may have improved the clinical outcomes of open surgical debridement for patients with acute pancreatitis, rendering older reports obsolete. In an environment in which minimally invasive techniques are increasingly taking hold with little direct comparison with open surgery, we present a contemporary series of open necrosectomies. These results may serve as a basis for comparison with newer techniques.

## Patients and Methods

### Data source

The Massachusetts General Hospital Division of General Surgery maintains a prospective pancreatic surgery database. With the approval of our Institutional Review Board, we performed a retrospective review of all patients undergoing pancreatic debridement for necrotizing pancreatitis over a 4-year period (January 2006 to December 2009), which covers all patients from our last published report to initiation of this study.<sup>8</sup> Because of increasing adoption of a “step-up” approach since the beginning of 2010, this time period provides the most contemporary data that could still be considered representative of a strategy based on open necrosectomy.<sup>9</sup>

### Variables

We collected patients' demographic and clinical characteristics including age, sex, admission source, cause of pancreatitis, history of immunosuppression, history of diabetes, Acute Physiology and Chronic Health Evaluation II (APACHE-II) score at presentation and at the time of debridement, need for intensive care unit (ICU) admission, presence of organ failure, and computed tomography (CT) findings. In the event of missing input parameters for the APACHE-II score, the most physiologically stable clinical values were employed. We defined organ failure as circulatory failure (systolic blood pressure <90 mm Hg or need for vasopressors), pulmonary insufficiency ( $\text{PaO}_2$  <60 mm Hg), or renal failure (creatinine >2 mg/dL after

rehydration), in accordance with the Atlanta classification of acute pancreatitis.<sup>10</sup> When CT images were available, we used the Balthazar criteria to grade the severity of acute pancreatitis from A (normal pancreas) to E (2 or more fluid collections and/or retroperitoneal air).<sup>11</sup> Additionally, the Balthazar grade was combined with the degree of necrosis to compute the acute pancreatitis CT severity index, which ranges from 0 (least severe) to 10 (most severe).<sup>11</sup>

We also collected treatment-related variables including the indication for debridement, time from onset of pancreatitis to debridement, preoperative use of percutaneous radiologically guided drainage catheters, and use of parenteral nutrition. Infected necrosis was diagnosed preoperatively in 1 of the 2 ways: (1) positive microbiologic cultures of the pancreatic or peripancreatic necrosis from fine-needle aspirate or percutaneous drain fluid or (2) air in the area of pancreatic necrosis visualized by CT imaging. Operative cultures were used as the gold standard for purposes of comparison. Failure to thrive was determined by a combination of malaise, nausea, persistent abdominal pain, and weight loss, which did not improve with nonoperative management. The surgical technique involved either a transmesocolic, anterior (through the gastrocolic omentum), or retroperitoneal approach to the pancreas, debridement of all the necrotic tissue and associated debris, external drainage with closed suction drains, and, in most cases, closed packing with stuffed penrose drains.<sup>12</sup> We recorded the exact approach used, operative time, and intraoperative blood transfusion. We defined “early” (vs “late”) operative intervention as surgical debridement sooner than 28 days from the onset of symptoms.

### Statistical analysis

The primary endpoint was in-hospital mortality. Secondary endpoints included new postoperative organ failure, reintervention (reoperation or percutaneous radiologically guided drain placement), wound infection, and pancreatic fistula. Pancreatic fistula was defined as continuous output from a drain placed in the pancreatic bed. The interval to spontaneous fistula closure was defined as the number of days from drain placement to drain removal not followed by fistula recurrence. We used chi-square tests or Fisher's exact tests to assess categorical variables and *t* tests or Mann-Whitney *U* tests to assess continuous variables. Patients with missing data were excluded from each respective analysis. We set the alpha level of statistical significance at .05. All data were analyzed using SAS version 9.3 (SAS, Cary, NC).

## Results

### Preoperative characteristics

We identified 68 consecutive patients who underwent open surgical debridement for necrotizing pancreatitis.

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