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Original Research Article

Management of necrotizing pancreatitis and its outcome in a secondary healthcare institution

Tanweer Karim*, Vinod Kumar, Vivek Kumar Katiyar, Subhash K.

Department of Surgery, ESIPGIMSR and Model Hospital, Basaidarapur, New Delhi, India

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***Correspondence:**
Dr. Tanweer Karim,
E-mail: karimtanweer@yahoo.co.in

ABSTRACT

Background: Surgical debridement is the "gold standard" for infected pancreatic necrosis. Advances in imaging methods and minimal access techniques have changed the management of many surgical conditions and even infected pancreatic necrosis has successfully been treated in selected patients. However, technical advances don't obviate sound clinical judgment. Aim was to consider recent advances in minimal access surgery, this article retrospectively analyses the role of open surgery and laparoscopic techniques in the management of necrotizing pancreatitis.
Methods: A retrospective study of 30 cases of pancreatic necrosectomy admitted and managed during 2012-2016 was carried out and compared with results available in the existing literature.
Results: Out of 30 cases, 20 were men and 10 were women. Patients' age ranged from 23 to 70 years (mean age - 49.8 years). The mean operating time was 103.8 min (range, 60-120 min). Timing of necrosectomy was 21-32 days (average - 25.5 days). The average duration of hospital stay after the procedure was 17.4 days (range, 10-21 days).
Conclusions: Comparative analysis of results of different surgical techniques reveals that there is no significant difference in terms of mortality. However, overall rate of complications and failure (inadequate debridement and drainage) are still higher with minimally invasive techniques.

Keywords: Complications of pancreatitis, Infective pancreatitis, Necrotizing pancreatitis, Retro-peritoneoscopy, Techniques of necrosectomy

INTRODUCTION

There has been great improvement in knowledge of the natural course and pathophysiology of acute pancreatitis over past decade. The clinical course of acute pancreatitis varies from mild transitory form to a severe necrotizing disease. Most episodes of acute pancreatitis (80%) are mild and self-limiting; subside spontaneously within 3-5 days.[1-4] Patients with mild pancreatitis respond well to medical treatment, require intravenous fluids and analgesics. In contrast, severe pancreatitis, associated with organ failure and/or local complications such as necrosis, abscess or pseudocyst, can be observed in 15-20% of all cases. Early phase of severe pancreatitis is seen in first two weeks. This is characterized by the systemic inflammatory response syndrome associated with pulmonary, cardiovascular and renal insufficiency.[5,6] Most patient with severe early organ dysfunction will have pancreatic necrosis on computerized tomographic scan. Infection of pancreatic necrosis can be observed in 40-70% of patients with necrotizing disease.[7,8] Late phase occurs most commonly in second or third week after admission and is due to infection of pancreatic necrosis. In recent years, treatment of severe acute pancreatitis has shifted away from early surgical treatment to aggressive intensive care.[9] While the treatment is conservative in the

earlier phase of the disease, surgery must be considered in the second phase.

The most significant change in the clinical course of acute pancreatitis over the past decade has been the decrease in overall mortality to approximately 5% and for severe cases to 10-20%. Despite the reduction in overall mortality in severe pancreatitis, the percentage of early mortality differs from less than 10% to 85% between various centers.[10]

There are two primary objectives in the initial treatment of patients with acute pancreatitis. The first is to provide supportive therapy and to treat specific complications. The second is to limit both the severity of pancreatic inflammation and necrosis and systemic inflammatory response by specifically interrupting their pathogenesis. The most important supportive therapy is adequate and prompts fluid resuscitation and supplemental oxygen. Infection in pancreatitis is secondary event. The rationale for the use of prophylactic antibiotics in severe pancreatitis is to prevent infection of pancreatic necrosis, its septic complications and mortality as demonstrated in several randomized controlled trials.[11-13] To date, inhibition of any known pathogenic step (example; octreotide, gabexate, mesilate, lexipafant) has not effectively reduced mortality or increased long term survival in severe acute pancreatitis.[14-16] However, endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic sphincterotomy (ES) are indicated in gall stone pancreatitis associated with impacted stone, biliary sepsis and obstructive jaundice.[17,18]

Differentiation between sterile and infected necrosis is essential for the management of acute pancreatitis. It requires direct computerized tomographic evidence of retroperitoneal gas or positive CT or USG guided fine needle aspiration for bacteriology of pancreatic and peri-pancreatic necrosis.[19,20] With surgical treatment, the mortality rate for patients with infected pancreatic necrosis could be decreased to approximately 20% in various specialized centers.[21-23] In recent years, several alternatives to the traditional open surgical approaches have been investigated and the absolute requirement for surgical intervention in infected necrosis has been challenged. Patients with severe necrotizing pancreatitis can progress to a critical condition within few hours to days after the onset of symptoms. Therefore, timing of necrosectomy has been a matter of debate. In the only prospective randomized trial comparing early (within 72 hours of onset of symptoms) with late (after12 days) pancreatic debridement in patients with severe pancreatitis, the mortality rate was 56% and 27% respectively.[24] Today, there is general agreement that surgery in severe pancreatitis should be performed as late as possible. The third to fourth week after the onset of symptoms is agreed to provide optimal operative conditions with well demarcated necrotic tissue. This decreases the risk of bleeding and minimizes vital tissue loss, and thus reduces endocrine and exocrine pancreatic insufficiency. Early surgery is only indicated in the event of rare complications, like bowel perforation and massive hemorrhage. Aim of the study was to consider recent advances in minimal access surgery, this article retrospectively analyses the role of open surgery and laparoscopic techniques in the management of necrotizing pancreatitis.

METHODS

A detailed study of 30 cases of pancreatic necrosectomy performed during 2012 and 2016 was carried out and compared with results in existing literature. Data regarding age and sex distribution, clinical presentation, investigations, management, and outcome were analysed. Factors responsible for deciding treatment option were analysed. The mean operating time and timing of necrosectomy were recorded. The outcome of patient has been correlated with the line of management and complications of specific procedure were also looked in to.

RESULTS

Out of 30 cases underwent pancreatic necrosectomy, 20 were men and 10 were women. Patients' age ranged from 23 to 70 years (mean age - 49.8 years). These patients presented with recurrent abdominal pain, abdominal distension or fever and chills, after recovering from acute pancreatitis. Ten patients had history of gallstone disease while twenty patients had history of regular alcohol intake. The preoperative investigations included abdominal ultrasound, CECT (Figure 1) and routine blood investigations. Ten of these patients had ultrasound guided pig tail drainage of the necrosis, following which they improved. Five haemodynamically stable patients were managed laparoscopically. Fifteen patients having CT severity index more than six were subjected to necrosectomy through open surgery (Table 1). Access to the pancreatic necrotic tissue was decided based on the status and site of the necrosis, as demonstrated by preoperative CECT. Retrogastric approach may be transgastrocolic or transmesocolic / infracolic approach. In transgastrocolic approach, gastrocolic ligament was opened to access the necrosed tissue (Figure 2). It was the preferred approach for necrosis involving head and body of pancreas. In trans-mesocolic or infracolic approach, the mesocolon was opened near ligament of Treitz, between middle colic artery and left colic artery. It was the preferred approach in necrosis involving tail region of pancreas and was used in one patient. Necrotic tissue was dissected and removed using blunt dissection in an endobag. Resultant cavity was washed thoroughly with normal saline and two 30F tube drains were positioned inside the cavity for post-operative lavage. The mean operating time was 103.8 min (range, 60-120 min). Timing of necrosectomy was 21-32 days (average - 25.5 days). The average duration of hospital stay after the procedure was 17.4 days (range, 10-21 days). Two patient (6%) died in post-operative period due to severe

sepsis. Ten patients (33%) developed pancreatic fistula which was managed conservatively. Three patients (10%) had port-site infection that was managed with oral antibiotics and local wound care.

Table 1: CT severity index in acute pancreatitis.

The CTSI sums two scores:
Grading of pancreatitis- Balthazar score (A-E)
Grading the extent of pancreatic necrosis
Grading of pancreatitis (Balthazar score)
A: normal pancreas: 0
B: enlargement of pancreas: 1
C: inflammatory changes in pancreas and peripancreatic fat: 2
D: ill-defined single peripancreatic fluid collection: 3
E: two or more poorly defined peripancreatic fluid collections: 4
Pancreatic necrosis
none: 0
≤30%: 2
>30-50%: 4
>50%: 6
The maximum score that can be obtained is 10.

Table 2: Outcome of different techniques for open necrosectomy.

Techniques	Patients	Patients with infected necrosis	Mortality	Complications fistula	Hemorrhage
Open packing					
Bradley, 1993	71	71 (100%)	15 (20%)	46%	7%
Branum, 1998	50	42 (84%)	6 (12%)	88%	-
Bosscha, 1998	28	28 (100%)	11 (39%)	25%	50%
Nieuwenhuijs, 2003	28	-	18 (47%)	-	-
Planned Re- Lap Sarr, 1991	23	18 (75%)	4 (17%)	78%	26%
Tsiotos, 1998	72	57 (79%)	18 (25%)	46%	18%
Closed packing Fernandez-del C	64	36 (56%)	4 (16%)	69%	2%
Closed continuous lavage					
Beger, 1988	95	37 (39%)	8 (8%)	-	-
Frkas, 1996	123	123 (100%)	9 (7%)	14%	2%
Buchler, 2000	29	27 (93%)	7 (24%)	-	-
Buchler,2 001	42	39 (93%)	9 (21%)	19%	5%
Nieuwenhuijs,2003	21	-	7 (33%)	-	-

Table 3: Outcome of percutaneous and endoscopic drainage.

Series	Patients	Infected	Mortality	Success	Sepsis	Fistula
Percutanous drainage	29	100%	8 (27%)	20 (69%)	25 (86%)	7%
Gmeiwieser, 1997	34	100%	4 (12%)	16 (47%)		0
Freeny, 1998	20	100%	0	20 (100%)	25 (74%)	50%
Echenique, 1998	32	81%	5 (15%)			52%
Gauzi, 1999	24	-	3 (12.5%)	21 (65%)	-	--
Szentkereszty, 2001				3 (12.5%)	11 (45%)	
Endoscopic drainage Braran, 1996	11	27%	0	9 (81%)	36%	

Table 4: Outcome of laparoscopy and retroperitoneoscopy.

Series	Patients	Infected	Mortality	Success	Morbidity
Laparoscopy Zhu, 2001	10	0	10%	90%	
Retroperitoneoscopy Gambiez, 1998	20	65%	10%	75%	60%
Carter, 2000	10	100%	20%	80%	28%
Harvath, 2001	6	100%	0	66%	33%
Castellanos, 2002	15	100%	27%	-	40%
Connor, 2003	24	58%	25%	67%	54%

Follow up ultrasound of abdomen was done in all patients after 3 months, which revealed recollection in three patients (10%) which was drained with pigtail catheter inserted under radiological guidance. All other patients were asymptomatic on follow-up. None of the patients developed newly detected Diabetes Mellitus or exocrine deficiency, on follow up.

Table 5: Statistical significance of difference in mortality in open techniques versus minimally invasive techniques.

Group	Open techniques	Minimally invasive techniques
Mean	22.417	13.208
SD	12.184	10.067
SEM	3.517	2.906
N	12	12

P value and statistical significance: The two-tailed P value equals 0.0559 by conventional criteria; this difference is not quite statistically significant. Confidence interval: The mean of group one minus group two equals 9.208 95% confidence interval of this difference: From -0.254 to 18.670 Intermediate values used in calculations: t = 2.0183; df = 22 standard error of difference = 4.562.

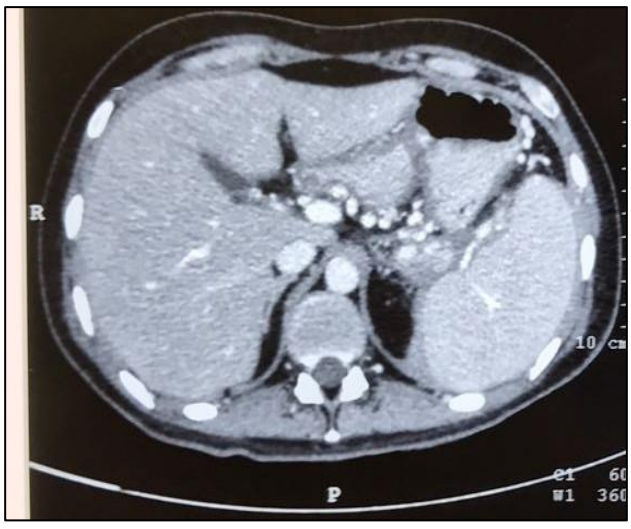

Figure 1: CECT abdomen showing pancreatic necrosis.

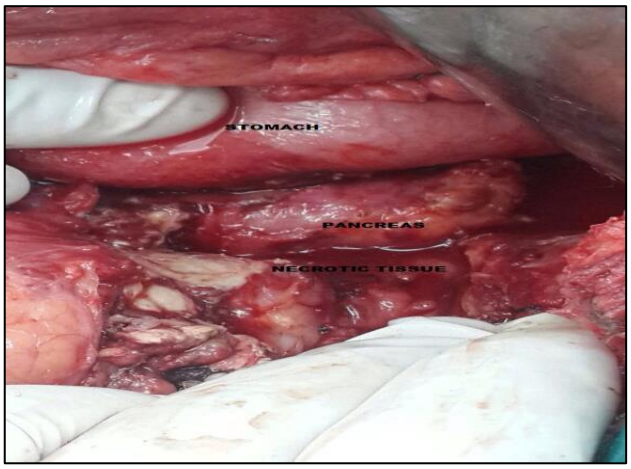

Figure 2: Pancreatic necrosis.

DISCUSSION

The most commonly adopted approach of necrosectomy is that of closed lavage of the debrided cavity, first described by Beger et al in 1982. Most techniques have an average mortality of 15-25%, even higher in multiple organ failure. The high mortality in infected pancreatic necrosis despite surgery has led to the development of several minimally invasive techniques, including radiological, endoscopic and laparoscopic, as alternative procedures (Table 2). Interventional techniques have become increasingly important in recent years due to ubiquitous availability of CT scan and ultrasonography. In 1998, Freeny et al, reported for the first time a series of patients with infected acute necrotizing pancreatitis who were exclusively drained by CT guided per-cutaneous catheter.[25] Earlier reports of drainage of pseudo-pancreatic cyst are also available. The radiological approach was taken to its limits by Gmeinwieser and colleagues.[25] They combined retroperitoneal necrosectomy, fragmentation of necrotic tissue by dormia basket and snare catheter, continuous lavage and bronchoscopic visualization of the cavity. Another series of catheter directed debridement of infected necrosis with stone retrieval baskets and floppy tipped guide-wires was published by Echenique and colleagues.[26]

Successful endoscopic drainage of asymptomatic sterile and infected pancreatic necrosis was reported by Baron et al as early as 1996.[27] The technique applied was

originally described for uncomplicated pseudocyst. Several transgastric and transduodenal drainage catheters and a nasopancreatic irrigation tube were endoscopically inserted into the retroperitoneum to perform necrosectomy. Lavage was continued until resolution of collection. In this report, mean duration of catheter placement was 19 days. Successful removal of necrosis was achieved in over 80% with no mortality. However, majority of patients treated had no necrosis but fluid collection with debris. Additionally, it is worthy to note that up to 60% of those treated developed recollection of fluid over subsequent two years. This confirmed that in the presence of necrosis, drainage must be combined with some form of surgical removal of necrotic tissue. In 1999, Baron and Morgan described successful placement of percutaneous endoscopic jejunostomy tube through a PEG tube and subsequently through transgastric track into the necrotic pancreatic collections.[27] The theoretical advantages of this technique are that on the one hand it avoids the need for uncomfortable naso-pancreatic catheters and on the other hand it avoids skin irritation due to external pancreatic fistula (Table 3).

Advances in laparoscopic technology and instrumentation allow utilization of minimally invasive surgery for the management of severe pancreatitis and its complications. As early as 1996, Gagner described laparoscopic Debridement and necrosectomy for the necrotizing pancreatitis by three different approaches, transgastric, retrogastric retrocolic and retroperitoneoscopic.[28]

In recent years, minimal invasive techniques using theoretical advantages of retroperitoneal access have been developed. Despite small variations in the different techniques, they have in common that the infected necrosis of the retroperitoneum is accessed under endoscopic visualization with subsequent debridement and lavage.[29] The results about morbidity and mortality of the larger series published are presented in Table 4. Morbidity ranges between 30% and 60%, the success rate of complete necrosectomy between 60% and 100% and the mortality in these series between 0% and 27%.

Although this appears that laparoscopic assisted necrosectomy is a safe alternative to open necrosectomy, the data must be interpreted with caution. During laparoscopic assisted necrosectomy there is significant potential for major injury to intra-abdominal organs or vascular structures. Indeed, all reports show high incidence of serious complications, including fistula (20%-60%) and bleeding (15%), despite pre-selection of patients. The difference in mortality of different techniques is not statistically significant (P value is 0.0559) (Table 5). However, timing of intervention in relation to onset of symptoms does have a significant bearing on outcome of these patients. Necrosectomy is associated with poorer outcome when performed within 2 weeks of presentation.[30]

CONCLUSION

Infected pancreatic necrosis is an indication for open surgery or interventional drainage. Surgery should be performed as late as possible, usually in 4th week after onset of symptoms. Organ preserving necrosectomy is the technique of choice. Morbidity is low in techniques which provide postoperative exit channels for further drainage of slough and debris. Percutaneous drainage (Pigtail catheter placement), Endoscopic drainage and retro-peritoneoscopy may play a role as temporary measures in critical early phase. Comparative analysis of results of different surgical techniques reveals that there is no significant difference in terms of mortality. However, overall rate of complications and failure (inadequate debridement and drainage) are still higher with minimally invasive techniques.

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