

Step-up management of walled-off necrosis with artificial intelligence support

Abstract

Necrotizing acute pancreatitis is associated with substantial morbidity and local and systemic complications. We report a 49-year-old man with cholelithiasis who developed acute biliary pancreatitis complicated by an extensive peripancreatic collection. Ultrasound-guided percutaneous drainage achieved initial decompression, but Walled-Off Necrosis (WON) persisted with marked extrinsic gastric compression. Following multidisciplinary discussion, supported by the institutional artificial intelligence platform SAMIA, EUS-guided trans gastric drainage was performed with placement of a Hot AXIOS™ lumen-apposing metal stent. The procedure was uneventful and followed by progressive clinical improvement, decreased inflammatory markers, and significant reduction of the collection. This case illustrates the successful use of a minimally invasive step-up approach for symptomatic WON and the potential role of artificial intelligence as an adjunct for information synthesis and multidisciplinary discussion, without replacing clinical judgment.

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Introduction

Acute pancreatitis is a major cause of hospitalization for gastrointestinal disease. Although most patients have a self-limited course, a subset develops moderately severe or severe disease, characterized by organ failure, pancreatic necrosis, and potentially life-threatening local complications. Among these complications, organized pancreatic necrosis, termed Walled-Off Necrosis (WON), is characterized by an encapsulated collection containing fluid and necrotic material, typically after maturation of the inflammatory process [1].

WON may remain asymptomatic. However, in selected cases, it may lead to secondary infection, persistent pain, gastrointestinal obstruction, compression of adjacent structures, and progressive clinical deterioration. In these situations, intervention should be individualized according to symptoms, collection maturity, the presence of infection, and the response to conservative treatment [2].

The clinical course of WON is variable. Some collections remain asymptomatic or regress spontaneously, whereas others may progress to infection, persistent pain, feeding intolerance, bleeding, or compression of adjacent structures [3]. The indication for intervention should therefore take into account the presence of symptoms or complications, the location and maturity of the collection, and the patient's clinical condition, preferably through multidisciplinary assessment [4].

In parallel, artificial intelligence models have been investigated in acute pancreatitis, particularly for integrating clinical and computed tomography data and for early prediction of disease severity. However, their use to support interventional planning for WON and multidisciplinary discussion remains poorly documented. Although the step-up approach is well established in the management of necrotizing pancreatitis, reports on the structured use of institutional artificial intelligence platforms to support multidisciplinary discussion and evidence retrieval in complex surgical cases remain scarce [5].

The aim of this report is to describe the management of a case of acute biliary pancreatitis complicated by WON, treated using a step-up approach with percutaneous drainage followed by EUS-guided transgastric drainage, together with complementary support from an institutional artificial intelligence platform.

Case presentation

A 49-year-old man with a history of symptomatic cholelithiasis presented to the emergency department with a 15-day history of band-like abdominal pain radiating to the back, associated with nausea, vomiting, dark urine, and progressive abdominal distension. On admission, he was pale and mildly febrile, with mild abdominal distension but no tenderness or signs of peritoneal irritation.

Given the clinical presentation and history of cholelithiasis, acute biliary pancreatitis was suspected. Contrast-enhanced computed tomography showed heterogeneous pancreatic enlargement and an extensive, poorly defined hypoattenuating peripancreatic collection involving the head, body, and tail, measuring 18.1×7.5 cm. Marked peripancreatic fat stranding was also present, without biliary duct dilatation.

Despite medical management, the patient progressed to biliary necrotizing pancreatitis with subsequent development of WON. Due to the persistent large collection, ultrasound-guided percutaneous drainage was performed as the first step of the step-up strategy. A 12-Fr catheter was placed, yielding approximately 600 mL of brown fluid, which was sent for microbiological and biochemical analyses. Follow-up ultrasonography confirmed appropriate catheter positioning without immediate complications.

Despite initial decompression, symptoms related to mass effect persisted. Follow-up computed tomography showed a large encapsulated peripancreatic collection containing the drain and causing marked extrinsic gastric compression. Additional findings included small bilateral pleural effusions, mild atelectatic changes, reactive mesenteric lymphadenopathy, minimal ascites, and cholelithiasis (Figure 1).

Given the insufficient response to percutaneous drainage, the case was reviewed by a multidisciplinary team including General Surgery, Therapeutic Endoscopy, Interventional Radiology, and Infectious Diseases. The institutional large language model-based platform SAMIA was used to integrate clinical and imaging data, retrieve relevant evidence, and compare therapeutic options. Its output was critically appraised by the clinicians, and all therapeutic decisions remained under medical responsibility.

Considering the maturity of the collection, its proximity to the posterior gastric wall, and persistent compressive symptoms, EUS-guided transluminal drainage was performed. A Hot AXIOS™ lumen-apposing metal stent was successfully placed without procedural complications.

Following EUS-guided drainage, the patient showed progressive clinical improvement, with resolution of abdominal pain, adequate oral intake, recovery of bowel function, and hemodynamic stability. By the sixth postprocedural day, epigastric fullness and the inflammatory response had decreased. Computed tomography showed a significant reduction in the pancreatic collection, although a smaller heterogeneous multiloculated collection with thickened walls

persisted. The trans gastric stent remained appropriately positioned, with no new local complications (Figure 2).

During hospitalization, the patient remained under contact precautions due to prior isolation of *Acinetobacter* spp., although cultures obtained after endoscopic drainage showed no bacterial growth. Given the favorable clinical, laboratory, and radiological course, the percutaneous drain was removed and antibiotic therapy was de-escalated. The patient was discharged in good clinical condition, with elective readmission planned in 2-3 weeks for stent removal.

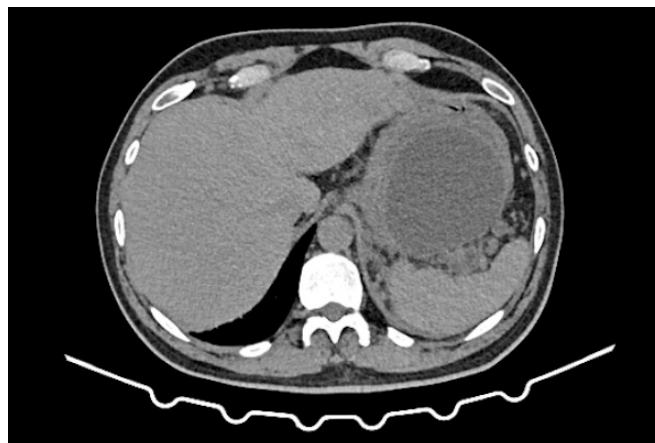


Figure 1: Computed tomography showing walled-off necrosis with a well-defined capsule and marked mass effect on the posterior gastric wall.



Figure 2: Computed tomography after EUS-guided trans gastric drainage showing marked reduction of the pancreatic collection and appropriate stent positioning.

Discussion

This case illustrates the step-up strategy for necrotizing acute pancreatitis complicated by WON. Percutaneous drainage achieved only partial decompression, and persistent symptoms with extrinsic gastric compression prompted therapeutic escalation [6,7]. This limited response may reflect the solid debris, septations, and necrotic components commonly found in WON, which can impair drainage through a catheter alone. Current guidelines recommend delaying invasive intervention, whenever feasible, until the collection is organized and encapsulated, while considering its location, adjacent structures, clinical status, and local expertise [2,7].

Because of the collection's proximity to the posterior gastric wall and persistent compressive symptoms, EUS-guided trans gastric drainage was performed. Placement of a Hot AXIOS™

lumen-apposing metal stent resulted in clinical and laboratory improvement, reduction of the collection, and resolution of compressive symptoms without additional mucosectomy [8,9]. These findings are consistent with evidence supporting minimally invasive step-up approaches. The PANTER trial reported fewer complications than open mucosectomy, while the TENSION and MISER trials supported endoscopic approaches, with benefits including fewer pancreatic fistulas, shorter hospitalization, and lower complication-related costs [2,6].

Artificial intelligence was also used as an adjunct during multidisciplinary discussion. Previous studies have explored AI models for integrating clinical, laboratory, and imaging data in acute pancreatitis and pancreatic surgery, particularly for risk stratification and complication prediction [9-11]. In this case, the platform supported data synthesis and evidence retrieval for surgical planning, while all therapeutic decisions remained under clinician responsibility.

This report has limitations due to its single-case design and short-term follow-up. In addition, the contribution of the AI platform cannot be independently quantified. Accordingly, no causal relationship between AI use and the clinical outcome can be established, and its role should be regarded as supportive rather than a substitute for clinical judgment [12,13]. Nevertheless, this case illustrates a structured application of AI-assisted information synthesis within an established step-up therapeutic strategy.

Conclusion

The step-up approach, progressing from percutaneous to EUS-guided trans gastric drainage, successfully controlled symptomatic WON and avoided surgical mucosectomy. Artificial intelligence served as an adjunct for information synthesis and multidisciplinary discussion, without allowing causal attribution to the clinical outcome. Further studies are needed to clarify its role in complex surgical decision-making.

Declaration of interest: The authors declare that they have no conflicts of interest, including any financial, personal, or professional affiliations that could have influenced the work reported in this case report.

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