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Acute Gallstone Pancreatitis: Clinical Presentation, Diagnosis, Complications, and Contemporary Management Approaches; A Narrative Review and Clinical Case of Transgastric Endoscopic Drainage and Repeated Endoscopic Necrosectomy

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Acute Gallstone Pancreatitis; Biliary Obstruction; Pancreatic Necrosis; Peripancreatic Fluid Collection; Endoscopic Ultrasound; Transgastric Drainage; Metallic Stent; Lumen-Apposing Metal Stent; Endoscopic Necrosectomy; ERCP; Step-Up Approach

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1. Abstract

1.1. Background

Acute gallstone pancreatitis is one of the most frequent causes of acute pancreatitis and remains an important clinical problem because of its unpredictable course and potential for serious local and systemic complications. The disease develops following transient or persistent obstruction of the distal biliary tract by gallstones or biliary sludge, resulting in pancreatic inflammation and, in severe cases, pancreatic or peripancreatic necrosis. Although most patients recover with appropriate supportive treatment and management of the underlying biliary pathology, some develop persistent peripancreatic collections that require minimally invasive or surgical intervention. Recent advances in endoscopic techniques, particularly endoscopic ultrasound-guided transmural drainage and direct endoscopic necrosectomy, have substantially changed the management of these complications.

1.2. Objective

To provide an extensive review of the clinical manifestations, diagnostic approaches, complications, and contemporary treatment strategies for acute gallstone pancreatitis, with particular attention to the management of persistent peripancreatic collections. A clinical case involving transgastric endoscopic drainage using a metallic stent and repeated endoscopic evacuation of purulent-necrotic material is also presented.

1.3. Materials and Methods

A narrative review of the literature was undertaken, focusing on international clinical guidelines, randomized controlled trials, systematic reviews, and relevant clinical studies concerning acute pancreatitis, biliary obstruction, pancreatic necrosis, endoscopic drainage, and minimally invasive treatment. The clinical case was analyzed using the available patient history, laboratory findings, imaging results, endoscopic procedures, and subsequent clinical response.

1.4. Clinical Case

A 65-year-old patient was admitted with severe upper abdominal pain and persistent nausea. Initial laboratory investigations revealed serum amylase of 4,100, leukocytosis of 29,000, anemia, decreased total serum protein, and elevated C-reactive protein. Imaging demonstrated gallbladder and common bile duct stones, inflammatory changes involving the pancreas, and a peripancreatic fluid collection estimated at approximately 300–340 mL. ERCP was performed, and common bile duct stones were extracted. Despite approximately 20 days of conservative treatment, follow-up imaging demonstrated insufficient regression

of the collection. Transgastric endoscopic drainage was subsequently performed through the posterior gastric wall using a metallic stent. Repeated endoscopic interventions were carried out at approximately weekly intervals to evacuate accumulated fluid and purulent-necrotic material. By the end of the fourth week, serum amylase had decreased to 120, the leukocyte count to 8,200, and CRP had approached normal values. The patient's general condition improved, allowing discharge with continued clinical and radiological follow-up.

1.5. Conclusion

The management of acute gallstone pancreatitis should be individualized according to disease severity, biliary obstruction, the presence and characteristics of local complications, and the patient's clinical response. In selected patients with symptomatic or infected organized peripancreatic collections, endoscopic transmural drainage followed, when necessary, by direct endoscopic necrosectomy may provide effective internal drainage while reducing the need for open surgical intervention. The presented case illustrates the potential role of repeated endoscopic treatment as part of a minimally invasive step-up strategy.

2. Introduction

Acute pancreatitis is an acute inflammatory condition of the pancreas that may involve the surrounding retroperitoneal tissues and, in severe cases, produce a systemic inflammatory response with dysfunction of distant organs. Its clinical course is highly variable, ranging from mild interstitial edematous inflammation, which usually resolves without significant long-term consequences, to severe necrotizing pancreatitis associated with persistent organ failure, infected necrosis, sepsis, and substantial mortality. Despite improvements in diagnostic imaging, intensive care, endoscopic intervention, and surgical techniques, acute pancreatitis continues to represent a considerable burden for emergency departments, gastroenterology services, intensive care units, and surgical departments [1-3].

The most common etiological factors of acute pancreatitis are gallstones and excessive alcohol consumption. Other recognized causes include hypertriglyceridemia, hypercalcemia, medication-related pancreatic injury, anatomical abnormalities of the pancreaticobiliary system, endoscopic procedures, trauma, infections, and hereditary predisposition. The relative contribution of these factors differs between geographical regions and populations. In many countries, gallstone disease represents the leading cause of acute pancreatitis, particularly among older adults and patients with a history of cholelithiasis [1,2].

Gallstone pancreatitis develops when a gallstone or biliary sludge migrates from the gallbladder into the common bile duct and temporarily or persistently obstructs the distal biliary tract, usually in the region of the ampulla of Vater. The obstruction may interfere with the normal outflow of pancreatic secretions and initiate a cascade of intracellular and extracellular events that result in pancreatic acinar cell injury, premature activation of digestive enzymes, and an inflammatory response. Although the precise mechanisms linking transient biliary obstruction to pancreatic injury remain complex, experimental and clinical evidence indicates that intracellular calcium disturbances, mitochondrial dysfunction, premature trypsinogen activation, oxidative stress, and inflammatory signaling pathways contribute to disease development and progression [4,5].

The clinical importance of gallstone pancreatitis is not limited to the initial pancreatic inflammatory episode. A retained common bile duct stone may maintain biliary obstruction and cause acute cholangitis, while persistent inflammation within the pancreas may lead to local complications even after successful biliary decompression. These complications include acute peripancreatic fluid collections, acute necrotic collections, pancreatic pseudocysts, walled-off necrosis, vascular complications, and infection of necrotic tissue. The development of these complications may considerably prolong hospitalization and require additional endoscopic, radiological, or surgical procedures [3,6].

The severity of acute pancreatitis is determined not only by the extent of pancreatic inflammation but also by the presence and duration of organ failure. According to the revised Atlanta classification, severe acute pancreatitis is characterized by persistent organ failure lasting more than 48 hours. Moderately severe disease is associated with transient organ failure or local and systemic complications without persistent organ failure, whereas mild disease is characterized by the absence of organ failure and local or systemic complications [6]. This classification has important practical implications because it helps determine the level of monitoring, the need for intensive care, the timing of imaging, and the indications for intervention.

The initial management of acute pancreatitis is based on early recognition, adequate fluid resuscitation, pain control, nutritional support, correction of metabolic disturbances, and repeated assessment of clinical status. Current recommendations favor moderately intensive and carefully monitored fluid administration rather than indiscriminate aggressive hydration. Lactated Ringer's solution is generally preferred over normal saline when intravenous crystalloid therapy is required. Early oral nutrition is encouraged when tolerated, while enteral feeding is preferred over parenteral nutrition in patients who cannot maintain adequate oral intake [1,2,7].

In patients with gallstone pancreatitis, treatment of the underlying biliary pathology is an essential component of management. ERCP is indicated when acute pancreatitis is accompanied by acute cholangitis or persistent biliary obstruction. However, the routine use of urgent ERCP in all patients with gallstone pancreatitis is not supported by current evidence. The APEC randomized controlled trial demonstrated that urgent ERCP did not significantly reduce major complications or mortality in patients with predicted severe gallstone pancreatitis without cholangitis, supporting a more selective approach to biliary intervention [8].

A particularly difficult clinical situation arises when acute pancreatitis progresses to pancreatic or peripancreatic necrosis and

the formation of persistent fluid or necrotic collections. In the past, open surgical necrosectomy was frequently used in patients with infected pancreatic necrosis. Although surgery may be life-saving in selected situations, it is associated with considerable physiological stress, postoperative complications, pancreatic fistula formation, and prolonged recovery. Over the last two decades, treatment has increasingly shifted toward minimally invasive approaches, including percutaneous catheter drainage, endoscopic transmural drainage, direct endoscopic necrosectomy, and minimally invasive retroperitoneal procedures [9–12].

The concept of the step-up approach has become central to the management of infected pancreatic necrosis. Instead of proceeding directly to extensive surgical debridement, treatment begins with appropriate medical therapy and drainage of the infected collection. Necrosectomy is performed only when the patient's clinical condition fails to improve adequately after drainage. The PANTER and TENSION trials provided important evidence supporting this strategy and contributed to the wider adoption of minimally invasive treatment [9,10].

Endoscopic transmural drainage has gained particular importance in patients with collections located adjacent to the stomach or duodenum. Through an endoscopic approach, a communication can be established between the gastrointestinal lumen and the collection, allowing internal drainage. The introduction of lumen-apposing metal stents has further expanded the technical possibilities of endoscopic treatment by providing a relatively wide conduit for drainage and, when necessary, direct endoscopic access for removal of necrotic material [11–13].

Nevertheless, the presence of a peripancreatic collection does not automatically indicate the need for drainage. The decision to intervene should be based on the patient's clinical condition, the presence of infection or persistent symptoms, the anatomical location of the collection, its contents, and the degree of encapsulation. Whenever clinically feasible, intervention should be delayed until the collection becomes sufficiently organized, usually after approximately four weeks from the onset of pancreatitis. Earlier intervention may be required in selected patients with clinical deterioration or complications that cannot be controlled by conservative treatment [1,3,11].

The 2025 revised International Association of Pancreatology guidelines provide updated recommendations covering the diagnosis, severity assessment, fluid management, nutritional support, biliary intervention, and treatment of pancreatic necrosis. They emphasize a conservative-first strategy in sterile necrosis and a minimally invasive step-up approach in suspected or confirmed infected necrotizing pancreatitis [1].

The present article discusses the clinical manifestations, diagnostic criteria, complications, and contemporary treatment options for acute gallstone pancreatitis, with particular attention to endoscopic drainage and repeated endoscopic necrosectomy. A clinical case is presented to demonstrate the practical application of transgastric drainage and repeated endoscopic cavity clearance in a patient with a persistent peripancreatic collection following acute gallstone pancreatitis.

3. Materials and Methods

3.1. Study Design

The present work was designed as a narrative review of the literature combined with a clinical case report. The literature review was intended to summarize current evidence concerning acute gallstone pancreatitis, with emphasis on the diagnostic process, clinical severity assessment, biliary interventions, development of local complications, and contemporary minimally invasive treatment methods.

The clinical case was analyzed separately and integrated into the discussion to illustrate the practical management of a patient with gallstone pancreatitis complicated by a persistent peripancreatic collection requiring transgastric endoscopic drainage and repeated endoscopic intervention.

3.2. Literature Search Strategy

A structured literature search was considered using the following electronic databases and scientific resources:

• PubMed/MEDLINE

• Google Scholar

• ScienceDirect

• Cochrane Library

• International gastroenterology and pancreatology society publications

• Clinical practice guidelines and consensus documents.

The search concepts included combinations of the following terms:"acute pancreatitis," "acute gallstone pancreatitis," "biliary pancreatitis," "common bile duct stones," "ERCP," "pancreatic necrosis," "infected necrosis," "peripancreatic fluid collection," "walled-off necrosis," "endoscopic ultrasound-guided drainage," "transgastric drainage," "lumen-apposing metal stent," "endoscopic necrosectomy," and "step-up approach." Priority was given to clinical guidelines, randomized controlled trials, systematic reviews, meta-analyses, and prospective clinical studies published between 2015 and 2025. Earlier landmark publications were included when they provided the foundation for current diagnostic classifications or treatment strategies.

3.3. Eligibility Criteria

Publications were considered relevant when they addressed one or more of the following topics:

1. Diagnostic criteria and severity classification of acute pancreatitis.

2. Etiology and pathophysiology of gallstone pancreatitis.

3. Clinical and radiological assessment of pancreatic and peripancreatic complications.

4. Indications and timing of ERCP in acute biliary pancreatitis.

5. Conservative management and supportive treatment.

6. Antibiotic therapy in infected pancreatic necrosis.

7. Endoscopic, percutaneous, and surgical drainage methods.

8. Direct endoscopic necrosectomy and the use of metallic stents.

9. Comparative outcomes of minimally invasive step-up strategies.

10. Timing of cholecystectomy following acute biliary pancreatitis.

Publications unrelated to acute pancreatitis, duplicate records, non-scientific sources, and articles without sufficient clinical or methodological information were not considered relevant to the principal review questions.

3.4. Clinical Case Data

The clinical case was based on the information available from the patient's medical history, laboratory investigations, imaging examinations, ERCP, transgastric endoscopic intervention, repeated endoscopic procedures, and subsequent clinical follow-up.

The following parameters were considered:

• Age and presenting symptoms

• Initial laboratory findings

• Evidence of gallbladder and common bile duct stones

• Radiological evidence of pancreatic inflammation and peripancreatic collection

• Response to initial conservative treatment

• Biliary intervention by ERCP

• Indication for transgastric drainage

• Repeated endoscopic evacuation of fluid and purulent-necrotic material

• Changes in laboratory parameters

• Clinical condition at discharge and planned follow-up

The exact stent model, its diameter and length, the detailed radiological classification of the collection, and the final post-discharge imaging results were not available in the information provided for preparation of this manuscript. These details should be added from the original medical records before final submission.

3.5. Interpretation of the Clinical Data

The clinical and laboratory findings were interpreted in the context of established diagnostic criteria for acute pancreatitis and the revised Atlanta classification. The presence of a peripancreatic collection was evaluated as a local complication, but the collection was not classified definitively as a pseudocyst or walled-off necrosis in the absence of sufficient imaging information.

The reported serum amylase and leukocyte values were retained as provided. Their units and laboratory reference ranges should be confirmed from the original reports.

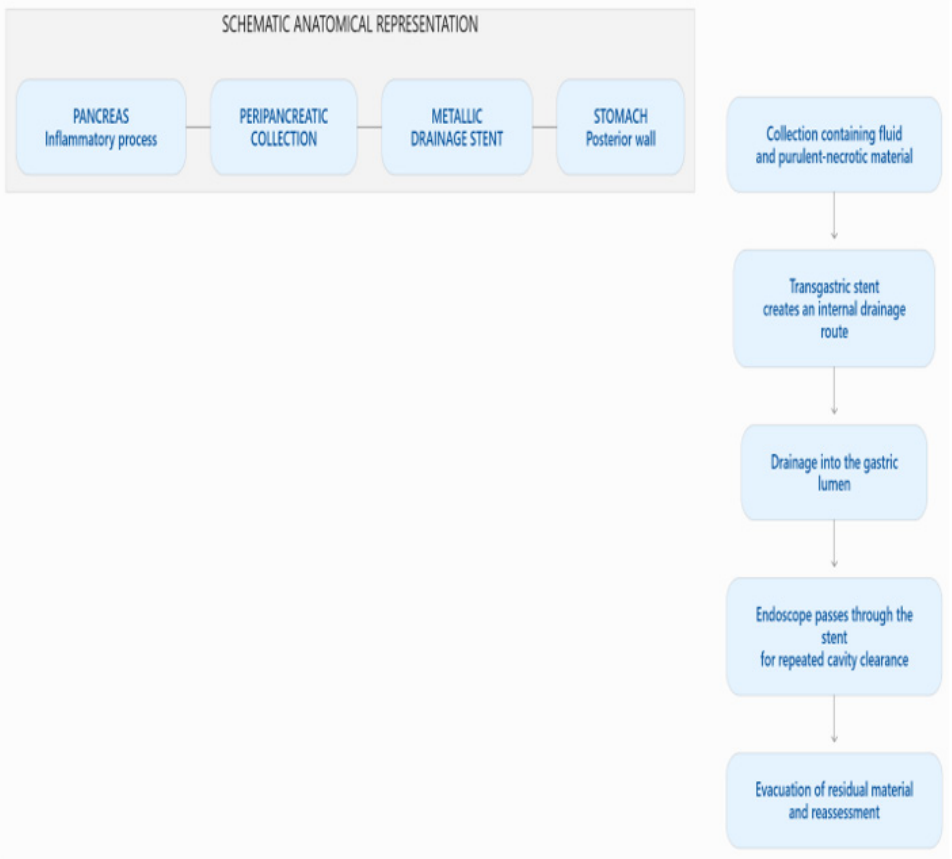


Figure 1: Conceptual diagram of transgastric endoscopic drainage. The stent establishes a communication between the peripancreatic collection and the gastric lumen, allowing internal drainage and subsequent endoscopic access. The diagram is illustrative and does not reproduce the exact anatomical dimensions or stent configuration of the patient.



Figure 2: Transgastric metallic stent placement for internal drainage of a peripancreatic collection.

Table 1: Revised Atlanta classification of acute pancreatitis.

Severity category	**Definition**	**Clinical significance**
Mild acute pancreatitis	No organ failure and no local or systemic complications	Usually resolves with supportive treatment
Moderately severe acute pancreatitis	Transient organ failure lasting less than 48 hours and/or local or systemic complications without persistent organ failure	Requires closer monitoring and treatment of complications
Severe acute pancreatitis	Persistent organ failure lasting more than 48 hours	Associated with increased mortality and often requires intensive care

Table 2: Principal laboratory investigations in acute gallstone pancreatitis.

Laboratory parameter	Clinical relevance
Serum lipase	Supports the diagnosis of acute pancreatitis
Serum amylase	Supports the diagnosis when significantly elevated
Leukocyte count	Reflects systemic inflammatory response
CRP	Helps assess inflammatory activity and disease progression
ALT and AST	May indicate hepatocellular injury associated with biliary obstruction
Bilirubin	Helps identify persistent biliary obstruction
ALP and GGT	Support assessment of cholestasis
Creatinine and urea	Assess renal function and intravascular volume status
Serum calcium	Identifies hypocalcemia or hypercalcemia
Serum glucose	Detects stress hyperglycemia or pancreatic endocrine dysfunction
Albumin and total protein	Provide information about nutritional and inflammatory status
Triglycerides	Help exclude hypertriglyceridemia as an alternative cause

Table 3: Principal diagnostic methods in acute gallstone pancreatitis.

Diagnostic method	Main purpose	Important limitations
Laboratory tests	Confirm pancreatic inflammation and assess biliary obstruction	Results must be interpreted in clinical context
Abdominal ultrasound	Identify gallbladder stones and biliary dilatation	May miss distal common bile duct stones
Contrast-enhanced CT	Evaluate pancreatic inflammation, necrosis, and collections	Very early CT may underestimate necrosis
MRCP	Assess biliary and pancreatic duct anatomy	May be less readily available
EUS	Detect small ductal stones and characterize collections	Operator-dependent and requires expertise
ERCP	Therapeutic biliary decompression and stone extraction	Invasive; should not be used routinely for diagnosis alone

Table 4: Classification of pancreatic and peripancreatic collections.

Collection	Typical timing	Contents	Wall
Acute peripancreatic fluid collection (APFC)	Within 4 weeks	Fluid without significant solid necrotic material	No mature wall
Acute necrotic collection (ANC)	Within 4 weeks	Fluid and variable amounts of necrotic material	No mature wall
Pancreatic pseudocyst	Usually after 4 weeks	Predominantly fluid, without significant solid necrosis	Mature inflammatory wall
Walled-off necrosis (WON)	Usually after 4 weeks	Encapsulated fluid and solid necrotic material	Mature inflammatory wall

Table 5: Comparison of contemporary treatment methods for pancreatic and peripancreatic collections.

Treatment method	Main indication	Advantages	Limitations and potential complications
Conservative treatment	Sterile necrosis and clinically stable patients	Avoids unnecessary intervention	Requires careful monitoring
Percutaneous drainage	Infected collections accessible through a safe percutaneous route	Can be performed under imaging guidance; useful in unstable patients	External fistula, catheter blockage, repeated exchanges
Endoscopic transmural drainage	Collections adjacent to stomach or duodenum	Internal drainage; avoids external catheter	Bleeding, perforation, stent migration
LAMS drainage	Selected organized collections, particularly those containing substantial necrotic material	Wide drainage channel; facilitates endoscopic access	Bleeding, buried stent, migration, need for timely reassessment
Direct endoscopic necrosectomy	Residual infected necrotic material after drainage	Direct removal under visualization	May require repeated procedures; bleeding and perforation risk
Minimally invasive surgical necrosectomy	Patients requiring debridement when endoscopic or percutaneous treatment is unsuitable or unsuccessful	Allows removal of substantial necrotic tissue	Operative risk and postoperative complications
Open surgical necrosectomy	Selected complex cases or failure of less invasive approaches	Direct access and debridement	Greater physiological stress and morbidity

Table 6: Laboratory changes during the clinical course.

Laboratory parameter	Initial assessment	By the end of week 4	Observed change
Serum amylase	4,100	120	Marked decrease
Leukocyte count	29,000	8,200	Marked decrease
C-reactive protein	Elevated	Near normal	Improvement
Total serum protein	Decreased	Not available	Not assessable
Hemoglobin	Anemia reported	Not available	Not assessable

4. Clinical Manifestations and Pathophysiology of Acute Gallstone Pancreatitis

4.1. Etiology and Mechanisms of Pancreatic Injury

Acute gallstone pancreatitis is caused by migration of gallstones or biliary sludge into the common bile duct, resulting in transient or persistent obstruction of the biliary-pancreatic outlet. The obstruction most frequently occurs at or near the ampulla of Vater, where the distal common bile duct and pancreatic duct are anatomically related.

A small stone may pass spontaneously into the duodenum, producing only transient obstruction. However, even temporary obstruction may initiate pancreatic inflammation. A retained stone may cause prolonged obstruction, cholestasis, and, in some cases, acute cholangitis.

The pathophysiological process is complex and involves several interconnected mechanisms:

• Obstruction of pancreatic juice outflow

• Abnormal intracellular calcium signaling

• Premature activation of digestive enzymes

• Mitochondrial dysfunction

• Acinar cell injury and necrosis

• Activation of inflammatory mediators

• Increased microvascular permeability

• Pancreatic interstitial edema

• Local and systemic inflammatory responses

Trypsinogen activation within pancreatic acinar cells has traditionally been regarded as a central event in the development of acute pancreatitis. However, current understanding emphasizes that pancreatic injury is not caused by a single enzymatic mechanism. Intracellular calcium overload, mitochondrial impairment, inflammatory signaling, and disturbances in autophagy also contribute to disease progression [4,5].

In mild cases, these processes remain limited and resolve with supportive treatment. In severe cases, extensive inflammation and microcirculatory disturbances may result in pancreatic parenchymal necrosis and necrosis of surrounding adipose tissue.

4.2. Clinical Manifestations

The clinical presentation of acute pancreatitis is usually characterized by sudden-onset, persistent upper abdominal pain. The pain is most frequently localized in the epigastric region and may radiate to the back. It may be severe and is often accompanied by nausea, vomiting, and reduced tolerance of oral intake.

Common clinical manifestations include:

• Acute epigastric pain

• Pain radiating to the back

• Nausea and vomiting

• Abdominal tenderness

• Abdominal distension

• Reduced intestinal motility

• Fever

• Tachycardia

• Dehydration

• Reduced urine output in severe cases

In gallstone pancreatitis, jaundice may occur when common bile duct obstruction persists. The combination of abdominal pain, fever, jaundice, and cholestatic laboratory abnormalities should raise suspicion of acute cholangitis, which requires prompt evaluation and appropriate biliary decompression.

Patients with severe disease may develop hypotension, respiratory insufficiency, renal dysfunction, altered mental status, and other signs of organ failure. Persistent systemic inflammatory response syndrome is associated with a higher risk of severe disease and adverse outcomes [1,2].

4.3. Severity Assessment

The revised Atlanta classification remains the principal internationally accepted system for classifying the severity of acute pancreatitis [6].

4.4. Laboratory Findings

Laboratory investigations play an important role in establishing the diagnosis, identifying the biliary etiology, evaluating disease severity, and monitoring treatment response.

Serum lipase is generally preferred because of its higher diagnostic specificity and longer period of elevation compared with amylase. Serum amylase remains widely used and may support the diagnosis when elevated to at least three times the upper limit of normal.

Liver function tests are important in patients with suspected gallstone pancreatitis. Elevated bilirubin, alkaline phosphatase, gamma-glutamyl transferase, and transaminases may indicate biliary obstruction. A marked early increase in alanine aminotransferase may support a biliary etiology, although it does not replace imaging.

The complete blood count, CRP, serum creatinine, urea, electrolytes, glucose, calcium, and albumin provide additional information about systemic inflammation, hydration, renal function, and metabolic disturbances.

5. Diagnostic Methods

5.1. Diagnostic Criteria

The diagnosis of acute pancreatitis is established when at least two of the following three criteria are present:

1. Characteristic abdominal pain consistent with acute pancreatitis.

2. Serum lipase or amylase activity at least three times the upper limit of normal.

3. Imaging findings characteristic of acute pancreatic inflammation [1,6].

Once acute pancreatitis has been diagnosed, the next step is to determine its etiology and assess its severity. In patients with suspected gallstone pancreatitis, abdominal ultrasonography and liver biochemical tests are particularly important.

5.2. Ultrasonography

Transabdominal ultrasonography is usually the first imaging investigation in suspected gallstone pancreatitis. It is non-invasive, widely available, and useful for identifying gallbladder stones, gallbladder wall abnormalities, biliary duct dilatation, and some common bile duct stones.

However, the diagnostic accuracy of ultrasonography may be limited by bowel gas, obesity, abdominal distension, and the location of the stone. Therefore, a negative ultrasound examination does not completely exclude choledocholithiasis when clinical suspicion remains high.

5.3. Computed Tomography

Contrast-enhanced CT is an important method for assessing pancreatic inflammation, necrosis, and local complications. It can identify pancreatic enlargement, peripancreatic fat stranding, fluid collections, areas of reduced parenchymal enhancement, gas within collections, and vascular complications.

CT should not be performed routinely at admission in every patient with uncomplicated acute pancreatitis. It is particularly useful when the diagnosis is uncertain, the patient fails to improve with conservative treatment, or clinical deterioration suggests the development of complications.

When pancreatic necrosis is suspected, CT performed after approximately 72 hours from symptom onset is generally more informative than very early imaging. Follow-up imaging should be guided by the clinical course and the need to evaluate complications rather than by a fixed schedule alone [1,2].

5.4. Magnetic Resonance Imaging and MRCP

MRI and MRCP are useful in patients with suspected common bile duct stones when ultrasound findings are inconclusive. MRCP can demonstrate biliary duct anatomy, ductal dilatation, and filling defects consistent with stones.

MRI may also help distinguish fluid from solid necrotic material within pancreatic collections. This distinction is important when deciding whether drainage alone is likely to be sufficient or whether subsequent necrosectomy may be required.

5.5. Endoscopic Ultrasound

EUS is a valuable diagnostic method for identifying small common bile duct stones and biliary sludge that may not be detected by transabdominal ultrasonography. It can also provide detailed information about the location and contents of pancreatic collections.

In selected patients, EUS-guided drainage may be performed during the same endoscopic session, provided that the collection is appropriately located and the procedure is clinically indicated.

5.6. ERCP In Gallstone Pancreatitis

ERCP is primarily a therapeutic procedure in the management of gallstone pancreatitis. It is indicated when persistent biliary obstruction or acute cholangitis is present.

The procedure may include endoscopic sphincterotomy, stone extraction, balloon sweeping, and biliary stent placement when complete clearance is not possible.

Routine urgent ERCP is not recommended in patients with gallstone pancreatitis who have neither cholangitis nor evidence of persistent biliary obstruction. The APEC trial demonstrated that urgent ERCP did not significantly reduce major complications or mortality in predicted severe gallstone pancreatitis without cholangitis [8].

6. Complications of Acute Gallstone Pancreatitis

Complications of acute pancreatitis may be divided into systemic complications and local pancreatic or peripancreatic complications. Their development depends on the intensity of inflammation, the presence of necrosis, infection, and the patient's general condition.

6.1. Systemic Complications

Systemic complications may develop as a consequence of the inflammatory response and associated circulatory disturbances. They include:

- Acute respiratory distress syndrome
- Acute kidney injury
- Cardiovascular instability
- Sepsis
- Metabolic disturbances
- Coagulation abnormalities
- Persistent organ failure

Persistent organ failure is associated with the highest risk of mortality and requires intensive monitoring and organ-supportive treatment.

6.2. Local Complications

Local complications include acute peripancreatic fluid collections, acute necrotic collections, pancreatic pseudocysts, and

walled-off necrosis.

The revised Atlanta classification distinguishes these entities according to the presence of necrosis, the composition of the collection, and the time elapsed since the onset of pancreatitis [6].

Correct classification is important because treatment decisions differ significantly. A simple fluid collection may resolve spontaneously, whereas an infected necrotic collection may require antibiotics and drainage.

A collection should not be classified as a pseudocyst or walled-off necrosis solely because it persists or has a large volume. Imaging characteristics, the presence of solid material, and the time course must be considered together.

6.3. Infected Pancreatic Necrosis

Infection of pancreatic necrosis is one of the most serious local complications of acute pancreatitis. It may develop during the course of necrotizing pancreatitis and is associated with sepsis, organ dysfunction, prolonged hospitalization, and increased mortality.

Clinical suspicion should arise when a patient with pancreatic necrosis develops new or persistent fever, worsening inflammatory markers, clinical deterioration, or signs of sepsis. Gas within a necrotic collection on CT is a particularly important radiological sign suggesting infection.

The diagnosis should be based on a combination of clinical, laboratory, and imaging findings. Routine fine-needle aspiration is not recommended in all patients because the diagnosis can often be established without invasive sampling [1,11].

Antibiotics are indicated when infected necrosis is suspected or confirmed, or when an extrapancreatic infection is present. Routine prophylactic antibiotic administration in sterile pancreatic necrosis is not recommended [1,2].

6.4. Vascular and other Complications

Severe pancreatitis may be complicated by splenic, portal, or mesenteric venous thrombosis, pseudoaneurysm formation, hemorrhage, gastrointestinal fistulas, and intra-abdominal hypertension.

Pseudoaneurysm-related bleeding is particularly important in patients undergoing drainage or necrosectomy. Before intervention, vascular complications should be considered and assessed when clinically indicated.

Intra-abdominal hypertension may develop due to visceral edema, fluid accumulation, ileus, and excessive fluid resuscitation. Severe cases may progress to abdominal compartment syndrome and require urgent multidisciplinary management [1].

7. Contemporary Management of Acute Gallstone Pancreatitis

7.1. General Principles of Treatment

The treatment of acute gallstone pancreatitis should be based on the severity of the disease, the presence of biliary obstruction, and the development of local or systemic complications.

The principal objectives are:

1. Stabilization of the patient's general condition

2. Adequate fluid resuscitation and correction of electrolyte abnormalities

3. Effective pain control

4. Early nutritional support

5. Identification and treatment of biliary obstruction

6. Prevention and management of infectious complications

7. Recognition and treatment of pancreatic and peripancreatic collections

8. Prevention of recurrent biliary pancreatitis

Treatment should be coordinated by a multidisciplinary team involving gastroenterologists, endoscopists, surgeons, radiologists, anesthesiologists, and intensive care specialists when required.

7.2. Conservative Treatment

Conservative management is the foundation of treatment in most patients with acute pancreatitis. Even in patients who eventually require drainage or necrosectomy, initial supportive treatment remains essential.

Fluid Therapy

Intravenous fluid administration is necessary to correct intravascular volume depletion and maintain tissue perfusion. Current recommendations favour moderately aggressive, goal-directed fluid therapy rather than uncontrolled high-volume infusion.

Lactated Ringer's solution is generally preferred. Fluid administration should be adjusted according to blood pressure, heart rate, urine output, hematocrit, blood urea nitrogen, renal function, and signs of fluid overload.

The WATERFALL trial demonstrated that aggressive fluid resuscitation increased the risk of fluid overload without improving clinical outcomes compared with a moderate fluid strategy [7].

Pain Management

Pain control is an essential component of treatment. Both opioid and non-opioid analgesics may be used depending on the intensity of pain, contraindications, and the patient's clinical condition.

Adequate analgesia improves patient comfort and facilitates respiratory function, mobilization, and nutritional recovery.

Nutritional Support

Early oral feeding is recommended when the patient is clinically stable and can tolerate oral intake. A low-fat solid diet may be started without requiring a prolonged progression from clear liquids.

In patients who cannot tolerate oral feeding, enteral nutrition should be initiated when possible. Nasogastric or nasojejunal feeding may be used according to clinical circumstances. Enteral nutrition is generally preferred to parenteral nutrition because it

helps maintain intestinal barrier function and may reduce infectious complications [1,2].

Correction of Electrolyte and Metabolic Disturbances

Patients with acute pancreatitis may develop disturbances in potassium, magnesium, calcium, glucose, and acid-base balance. These abnormalities should be identified and corrected according to laboratory findings and clinical status.

Hypocalcemia may occur in severe pancreatitis and may reflect fat necrosis and systemic inflammatory processes. Serum glucose should be monitored because pancreatic injury and stress responses may impair glucose regulation.

Antibiotic Therapy

Antibiotics should not be administered routinely to prevent infection in sterile pancreatic necrosis. They are indicated when infected necrosis or an extrapancreatic bacterial infection is suspected or confirmed.

When infection is suspected, antibiotic selection should consider the likely organisms, local resistance patterns, tissue penetration, renal function, and microbiological results. Antibiotic therapy should be reassessed as new clinical and microbiological information becomes available [1,11].

7.3. Treatment of Biliary Obstruction

The management of the biliary cause is essential in patients with gallstone pancreatitis.

ERCP is indicated when there is acute cholangitis or persistent common bile duct obstruction. If a common bile duct stone is identified by imaging, therapeutic extraction should be considered.

In patients without cholangitis or persistent obstruction, urgent ERCP is not routinely required. EUS or MRCP may be used to clarify the presence of retained stones when the diagnosis is uncertain [1,8].

Following recovery, cholecystectomy is generally recommended to prevent recurrent biliary events. In mild biliary pancreatitis, cholecystectomy should usually be performed during the same hospital admission. In patients with moderate or severe pancreatitis, particularly those with necrosis and significant peripancreatic collections, surgery may need to be delayed until the inflammatory process and collections have sufficiently resolved [1,2].

7.4. Conservative Management of Pancreatic Necrosis

The presence of pancreatic necrosis does not automatically require intervention. Sterile necrosis can often be managed conservatively, particularly during the early phase of the disease.

Treatment includes:

- Adequate organ support
- Appropriate fluid management
- Nutritional support
- Pain control
- Monitoring for infection
- Repeated clinical assessment
- Imaging when indicated

In patients with suspected infected necrosis, the initial approach should generally include appropriate antibiotics and careful clinical monitoring. Drainage is considered when infection or clinical deterioration persists despite medical treatment [1,11].

7.5. Indications For Drainage of Peripancreatic Collections

Drainage is not indicated solely because a collection is large or has persisted for a certain period. The decision should be based on clinical symptoms, evidence of infection, anatomical relationships, and the response to conservative treatment.

The principal indications include:

- Infected pancreatic or peripancreatic necrosis
- Persistent abdominal pain attributable to the collection
- Gastric outlet obstruction
- Biliary obstruction caused by compression
- Persistent systemic inflammatory response
- Nutritional failure
- Inability to recover clinically despite appropriate supportive treatment
- Other complications directly related to the collection.

When possible, drainage should be postponed until the collection is sufficiently organized. This usually occurs after approximately four weeks, when a mature wall may facilitate safer access and more effective drainage.

7.6. Percutaneous Drainage

Percutaneous catheter drainage is performed under ultrasound or CT guidance. A catheter is inserted through the abdominal or retroperitoneal route into the collection, allowing evacuation of infected fluid and providing a route for repeated irrigation when appropriate.

This method is useful when collections are located in areas that are not easily accessible by endoscopic transmural drainage or when the patient is too unstable for a prolonged endoscopic procedure.

Its limitations include the possibility of external pancreatic fistula formation, catheter displacement, blockage, and the need for repeated catheter exchanges or additional interventions.

7.7. Endoscopic Transmural Drainage

Endoscopic transmural drainage has become an important minimally invasive treatment method for selected pancreatic and peripancreatic collections adjacent to the stomach or duodenum.

The procedure is commonly performed under EUS guidance. The endoscopist identifies the collection, evaluates its relationship to adjacent vessels, selects an appropriate puncture site, and establishes communication between the gastrointestinal lumen and the collection.

Depending on the collection's contents and the intended treatment, drainage may be performed using plastic stents or metallic stents, including lumen-apposing metal stents.

The main advantages of endoscopic transmural drainage include internal drainage, avoidance of an external catheter, direct access to the collection, and the possibility of repeated endoscopic intervention.

7.8. Metallic Stents and Lumen-Apposing Metal Stents

Lumen-apposing metal stents are specifically designed to create a stable communication between the gastrointestinal lumen and an adjacent collection. Their flanged configuration helps maintain the connection between the stomach or duodenum and the collection.

The relatively large diameter of these stents may facilitate drainage of viscous material and provide access for an endoscope during direct endoscopic necrosectomy.

However, the term LAMS should not be used automatically for every metallic stent. Conventional self-expanding metal stents and LAMS differ in their design and clinical application. The exact stent type, diameter, length, and manufacturer should be documented in the clinical report.

Potential complications include bleeding, perforation, stent migration, stent occlusion, buried stent syndrome, and vascular injury. The timing of stent removal should be individualized and should take into account collection resolution and the risk of delayed complications.

7.9. Direct Endoscopic Necrosectomy

Direct endoscopic necrosectomy is used when drainage alone does not adequately resolve a collection containing substantial solid necrotic material.

The endoscope is advanced through the established transmural access into the collection. Necrotic material is removed under direct visualization using appropriate endoscopic accessories.

The procedure may require several sessions because extensive necrotic material cannot always be safely removed during a single intervention. The timing of repeat sessions should be based on the patient's clinical response, the amount of residual material, and endoscopic or radiological findings.

The procedure should be performed in centers with appropriate endoscopic expertise and access to radiological and surgical support because bleeding and perforation may occur.

7.10. Step-up Approach

The step-up approach is based on the principle that treatment should begin with the least invasive effective intervention and progress to more invasive procedures only when clinically necessary.

In patients with infected necrosis, the initial strategy generally includes appropriate antibiotic treatment and supportive care. If the patient does not improve adequately, percutaneous or endoscopic drainage is performed. Necrosectomy is reserved for patients with persistent infection or clinical deterioration despite adequate drainage.

The PANTER trial demonstrated that a minimally invasive step-up approach reduced the composite outcome of major complications or death compared with primary open necrosectomy [9]. The TENSION trial subsequently compared endoscopic and surgical step-up approaches, demonstrating that both strategies were effective, with differences in specific complications and subsequent interventions [10].

The POINTER trial further demonstrated that immediate drainage was not superior to postponed drainage in patients with infected necrotizing pancreatitis. Postponed intervention reduced the number of invasive procedures required, supporting the principle of delaying drainage when the patient's clinical condition allows [12].

8. Clinical Case Presentation

8.1. Initial Presentation and Clinical Assessment

A 65-year-old patient was admitted to the hospital with complaints of severe upper abdominal pain accompanied by persistent nausea. The intensity and persistence of the pain, together with the associated gastrointestinal symptoms, raised suspicion of acute pancreatitis and required further laboratory and imaging investigations.

Initial laboratory investigations demonstrated marked hyperamylasemia, with a reported serum amylase concentration of 4,100, and pronounced leukocytosis, with a leukocyte count of 29,000. Anemia, reduced total serum protein, and elevated C-reactive protein were also reported.

These findings were consistent with an active inflammatory process involving the pancreas. The marked leukocytosis and elevated CRP indicated a substantial systemic inflammatory response; however, these parameters alone cannot establish the presence of infected pancreatic necrosis. The diagnosis of infection requires correlation with the patient's clinical condition, imaging findings, and, when available, microbiological evidence.

8.2. Imaging Findings and Identification of The Biliary Etiology

Imaging examinations demonstrated gallbladder stones and stones within the common bile duct. Inflammatory changes involving the pancreas were also identified, together with a peripancreatic fluid collection estimated at approximately 300–340 mL.

The combination of characteristic abdominal symptoms, elevated pancreatic enzymes, and imaging evidence of pancreatic inflammation supported the diagnosis of acute pancreatitis. The presence of gallbladder and common bile duct stones indicated a biliary etiology.

The peripancreatic collection represented an important local complication and required further assessment during the patient's clinical course. Its persistence and composition were particularly relevant to subsequent treatment planning.

It should be emphasized that the available information does not provide sufficient detail to classify the collection definitively as an acute peripancreatic fluid collection, acute necrotic collection, pancreatic pseudocyst, or walled-off necrosis. Such classi-

fication requires assessment of the time elapsed since symptom onset, the presence or absence of necrotic material, and the degree of encapsulation on imaging.

8.3. Endoscopic Treatment of Common Bile Duct Stones

Because common bile duct stones were identified, ERCP was performed to address the biliary obstruction. During the procedure, the common bile duct stones were extracted.

The intervention was directed at eliminating the identified biliary cause and restoring bile duct drainage. Successful stone extraction addressed the mechanical component of the disease, although it did not immediately resolve the pancreatic inflammatory process or the already established peripancreatic collection.

This distinction is clinically important. In patients with gallstone pancreatitis, removal of the obstructing stone may prevent continued biliary obstruction, but pancreatic inflammation and local complications may continue to evolve after biliary decompression.

8.4. Initial Conservative Treatment

Following ERCP, the patient continued to receive conservative treatment for approximately 20 days.

The reported treatment included intravenous sodium chloride solution and correction of electrolyte disturbances, including potassium, magnesium, and calcium supplementation. Albumin administration and antibiotic therapy were also reported.

The patient remained under clinical observation, with monitoring of laboratory parameters and the evolution of the pancreatic and peripancreatic inflammatory process.

The treatment period was clinically important because it allowed assessment of the response to initial supportive therapy and the natural evolution of the peripancreatic collection.

Despite this treatment, follow-up imaging demonstrated insufficient regression of the collection. The persistence of the collection, considered together with the clinical course and the treating team's assessment, led to the decision to perform endoscopic internal drainage.

The use of antibiotics in this case should be interpreted in the context of the original clinical records. Current guidelines do not recommend prophylactic antibiotics for sterile pancreatic necrosis; antibiotic treatment is appropriate when infection is suspected or confirmed [1,2].

8.5. Indication for Transgastric Endoscopic Drainage

The decision to proceed with endoscopic drainage was based on the persistence of the peripancreatic collection despite a prolonged period of conservative treatment and the need to establish effective internal drainage.

A transgastric route was selected. This approach provides access to collections located in close anatomical proximity to the posterior gastric wall and allows the creation of a communication between the collection and the gastric lumen.

The principal objective of the procedure was to establish continuous internal drainage and, if necessary, provide access for repeated endoscopic evacuation of residual fluid and necrotic material.

8.6. Transgastric Placement of The Metallic Stent

The endoscopic intervention was performed through the posterior wall of the stomach. A metallic stent was placed to establish communication between the gastric lumen and the peripancreatic collection.

The stent provided an internal drainage route through which fluid and other accumulated contents could pass into the stomach. In addition, the established access allowed subsequent endoscopic procedures to be performed without the need to create a new access route during each intervention.

The exact type of metallic stent was not specified in the available clinical information. Therefore, the device is described as a metallic stent in this manuscript. If the original endoscopy report confirms that a lumen-apposing metal stent was used, the description should be updated to include the term LAMS and, where available, the manufacturer's name, model, diameter, and length.

8.7. Repeated Endoscopic Interventions and Evacuation of Necrotic Material

Following the initial stent placement, repeated endoscopic procedures were performed at approximately weekly intervals under general anesthesia.

During these procedures, the endoscope was advanced through the established transgastric access into the collection. Accumulated fluid and purulent-necrotic material were evacuated, with the aim of improving drainage and reducing the residual burden of inflammatory and necrotic contents.

The repeated interventions were considered necessary because a single drainage procedure may not be sufficient when the collection contains viscous fluid, debris, or solid necrotic material. In such cases, continued drainage and repeated endoscopic cavity clearance may be required to achieve adequate resolution.

The treatment strategy was consistent with the general principles of a minimally invasive step-up approach: initial internal drainage was established, followed by further endoscopic intervention according to the clinical course and the residual contents of the collection.

The repeated procedures also provided an opportunity to reassess the cavity and remove material that could interfere with drainage.

8.8. Clinical and Laboratory Response

Following the endoscopic interventions, the patient's clinical condition gradually improved. Laboratory investigations demonstrated a substantial reduction in pancreatic enzyme activity and systemic inflammatory parameters.

By the end of the fourth week, serum amylase had decreased from 4,100 to 120, while the leukocyte count had decreased from 29,000 to 8,200. CRP had approached normal values.

The reduction in serum amylase and leukocyte count, together

with the improvement in CRP, indicated a favorable clinical and biochemical response. Nevertheless, laboratory improvement alone cannot confirm complete resolution of the peripancreatic collection. Follow-up imaging remains necessary to assess the residual cavity, the presence of necrotic material, and the status of the drainage tract.

8.9. Discharge and Planned Follow-Up

After gradual clinical improvement and normalization or substantial improvement of the available inflammatory parameters, the patient was discharged from the hospital.

The discharge plan included continued clinical and laboratory follow-up, together with repeat CT assessment at approximately 10-day intervals according to the treating team's plan.

Cholecystectomy was planned for reconsideration approximately one month later, depending on the patient's recovery and the status of the peripancreatic collection.

The timing of cholecystectomy is particularly important in patients with moderate or severe biliary pancreatitis and persistent peripancreatic collections. Current recommendations support early cholecystectomy during the index admission in mild biliary pancreatitis, while surgery should generally be delayed in patients with severe disease and significant collections until the inflammatory process and local complications have sufficiently resolved [1,2].

9. Discussion

Acute gallstone pancreatitis is a multifactorial disease in which the initial biliary obstruction may be followed by a prolonged pancreatic inflammatory response and the development of local complications. The clinical course is not determined solely by whether the obstructing stone is removed. In patients with significant pancreatic injury, inflammation, necrosis, and peripancreatic collections may persist after successful biliary decompression.

The presented case illustrates this clinical situation. Common bile duct stones were extracted by ERCP, but the peripancreatic collection did not regress sufficiently during approximately 20 days of conservative treatment. A transgastric drainage procedure was therefore performed, followed by repeated endoscopic evacuation of accumulated fluid and purulent-necrotic material. The patient's laboratory parameters subsequently improved considerably.

Several aspects of this clinical course deserve particular consideration in the context of current evidence.

9.1. Biliary Decompression and The Continuing Evolution of Pancreatic Inflammation

The first important component of treatment in gallstone pancreatitis is the identification and management of persistent biliary obstruction.

ERCP is an established therapeutic method for removing common bile duct stones and restoring biliary drainage. However, the timing of ERCP should be based on the presence of cholangitis or persistent obstruction rather than on the diagnosis of pancreatitis alone.

The APEC randomized controlled trial evaluated urgent ERCP with sphincterotomy in patients with predicted severe acute gallstone pancreatitis without cholangitis. The results did not demonstrate a significant reduction in major complications or mortality with routine urgent ERCP compared with conservative treatment. The findings support selective rather than indiscriminate use of urgent ERCP [8].

In the presented case, common bile duct stones were identified and removed. Thus, the endoscopic intervention was directed at a documented biliary abnormality rather than being performed solely because pancreatitis was present.

It is important to distinguish the successful treatment of biliary obstruction from the subsequent management of pancreatic complications. Removal of the stone eliminates the mechanical obstruction but does not necessarily reverse pancreatic tissue injury that has already occurred.

8.2. Persistent peripancreatic collections: when is intervention necessary?

One of the most important decisions in the management of complicated acute pancreatitis is determining whether a persistent collection requires intervention.

The size of a collection alone is not sufficient to establish an indication for drainage. Some collections resolve spontaneously, while others remain clinically silent despite considerable dimensions. Intervention is more strongly justified when the collection is infected, causes persistent symptoms, produces gastric outlet or biliary obstruction, contributes to nutritional failure, or is associated with clinical deterioration.

The revised Atlanta classification provides an important framework for differentiating acute fluid collections from acute necrotic collections, pseudocysts, and walled-off necrosis [6]. This distinction is not merely terminological. It affects the choice of intervention, the expected response to drainage, and the need for direct necrosectomy.

In the present case, the collection was reported to have an estimated volume of approximately 300–340 mL. However, the exact radiological composition and degree of encapsulation were not provided. For this reason, the manuscript appropriately describes it as a peripancreatic collection without assigning a definitive classification.

The 2025 IAP guidelines recommend conservative management of sterile necrosis during the early phase and a step-up approach in patients with suspected or confirmed infected necrotizing pancreatitis. They also emphasize that drainage and necrosectomy should be selected according to clinical indications and anatomical findings rather than performed routinely [1].

9.3. Importance of Delaying Intervention When Clinically Feasible

The timing of intervention is particularly important in patients

with pancreatic necrosis.

During the early phase of pancreatitis, necrotic tissue may be poorly demarcated and adherent to viable structures. Early surgical or endoscopic debridement may therefore be associated with bleeding, perforation, incomplete removal of necrotic material, and additional tissue injury.

As the inflammatory process evolves, necrotic tissue becomes more clearly demarcated and the collection may develop a mature wall. This process generally takes approximately four weeks, although the timing varies between patients.

The POINTER trial compared immediate with postponed intervention in patients with infected necrotizing pancreatitis. Immediate drainage did not demonstrate superiority over postponed drainage. The postponed strategy resulted in fewer invasive interventions, and a proportion of patients managed with delayed intervention did not require drainage during the study period [12].

These findings support a conservative-first strategy in clinically stable patients. However, delaying intervention should not be interpreted as an absolute rule. Patients with uncontrolled sepsis, progressive organ dysfunction, or other serious complications may require earlier intervention.

In the presented case, conservative treatment was continued for approximately 20 days, but follow-up imaging demonstrated insufficient regression of the collection. The treating team subsequently selected an endoscopic drainage strategy. The exact timing and justification should be interpreted together with the patient's clinical condition and the CT findings at the time of intervention.

9.4. The Role of Endoscopic Transmural Drainage

Endoscopic transmural drainage has become an important minimally invasive treatment method for selected pancreatic and peripancreatic collections.

The technique is particularly suitable when the collection is located adjacent to the stomach or duodenum, allowing a safe access route to be established. The principal advantage is the creation of an internal drainage pathway without the need for a permanent external catheter.

This approach may reduce the risk of an external pancreatic fistula and may allow repeated access to the collection during subsequent endoscopic procedures.

The American Gastroenterological Association Clinical Practice Update emphasizes the role of endoscopic transmural drainage in appropriately selected patients with walled-off pancreatic necrosis. It also recognizes that direct endoscopic necrosectomy may be necessary when drainage alone does not produce an adequate clinical response [11].

The transgastric route used in the presented case was selected to establish internal drainage through the posterior gastric wall. This approach also provided access for repeated endoscopic procedures, allowing evacuation of residual material through the existing tract.

8.5. Metallic stents and the development of LAMS technology

The introduction of lumen-apposing metal stents has expanded the possibilities of endoscopic management of pancreatic collections.

Unlike conventional plastic stents, LAMS have a flanged design that helps maintain communication between the gastrointestinal lumen and the collection. Their relatively wide diameter may facilitate drainage of viscous contents and allow the passage of an endoscope for direct necrosectomy.

However, the choice between plastic stents and metallic stents should be based on the collection's composition, anatomical characteristics, intended intervention, and the experience of the endoscopy team.

The 2025 IAP guidelines recognize the use of multiple plastic stents or LAMS for endoscopic transluminal drainage of walled-off necrosis. They recommend considering LAMS particularly in infected walled-off necrosis or when the necrotic component is extensive [1].

The exact stent type used in the presented case should be verified from the original endoscopy documentation. If it was a LAMS, the manuscript should include its diameter and length, because these technical details are relevant to the reproducibility of the procedure.

The distinction is important because a conventional self-expanding metallic stent should not be described as a lumen-apposing metal stent unless its design and model have been confirmed.

9.6. Repeated Endoscopic Necrosectomy and The Step-Up Principle

Drainage alone may be insufficient in patients whose collections contain substantial solid necrotic material. In such cases, direct endoscopic necrosectomy may be required.

The procedure allows the endoscopist to enter the collection through the established transmural access and remove loose necrotic material under direct visualization.

Repeated sessions may be necessary because extensive necrosis cannot always be removed safely in one procedure. The decision to repeat the intervention should be based on clinical response, the amount of residual material, the effectiveness of drainage, and the risk of complications.

The presented case involved repeated endoscopic procedures at approximately weekly intervals. During these sessions, accumulated fluid and purulent-necrotic material were evacuated through the previously established transgastric access.

This treatment strategy is consistent with the principle of step-up management, in which drainage is performed first and further intervention is added only when necessary.

9.7. Evidence Supporting Minimally Invasive Step-Up Treatment

The PANTER trial was a major milestone in the management of necrotizing pancreatitis. It compared a minimally invasive step-up approach with primary open necrosectomy and demonstrated

a reduction in the composite outcome of major complications or death in the step-up group [9].

The TENSION trial compared an endoscopic step-up approach with a surgical step-up approach in patients with infected necrotizing pancreatitis. Although the primary composite outcome of major complications or death was not significantly different between the two groups, endoscopic treatment was associated with fewer pancreatic fistulas and a shorter hospital stay in the initial study [10].

Long-term follow-up of the TENSION trial, published as the Ex-TENSION study, provided additional information on outcomes after endoscopic and surgical step-up treatment. The findings supported the role of endoscopic treatment in selected patients while demonstrating that neither approach is universally appropriate for all anatomical and clinical situations [13].

These studies support a multidisciplinary approach in which the choice of drainage route is based on the anatomical location of the collection, the presence of necrotic material, the patient's physiological condition, and the availability of appropriate expertise.

9.8. Comparison of Endoscopic, Percutaneous, and Surgical Treatment

Endoscopic, percutaneous, and surgical interventions should not be considered competing methods in every clinical situation. They represent complementary approaches that may be used individually or in combination.

Endoscopic drainage is particularly useful for collections adjacent to the stomach or duodenum. Percutaneous drainage may be more appropriate for collections extending into the paracolic gutters, pelvis, or other areas not readily accessible endoscopically. Minimally invasive surgical approaches may be necessary when drainage is insufficient or when the distribution of necrosis makes endoscopic treatment unsuitable.

Open surgery is generally reserved for selected patients with complex complications, failure of less invasive approaches, or associated intra-abdominal conditions requiring operative treatment.

The choice of method should therefore be individualized rather than based on a single universal treatment pathway.

9.9. Interpretation of Laboratory Improvement in The Presented Case

The patient's laboratory findings demonstrated substantial improvement during the treatment period.

Serum amylase decreased from 4,100 to 120, while the leukocyte count decreased from 29,000 to 8,200. CRP also approached normal values.

These changes are consistent with a reduction in pancreatic enzyme activity and systemic inflammatory response. They provide supportive evidence of clinical improvement following the combined treatment strategy.

Nevertheless, serum amylase is not a reliable standalone marker of the resolution of pancreatic necrosis or the disappearance of a peripancreatic collection. The clinical response must be assessed together with symptoms, nutritional status, organ function, inflammatory markers, and follow-up imaging.

A final assessment should document whether the collection has resolved, whether residual solid material remains, and whether the stent has been removed or exchanged.

9.10. Timing of Cholecystectomy and Prevention of Recurrence

Definitive management of gallstone disease is necessary to reduce the risk of recurrent biliary pancreatitis.

In patients with mild gallstone pancreatitis, cholecystectomy during the same hospital admission is generally recommended. In patients with moderate or severe disease, particularly those with necrotizing pancreatitis or persistent peripancreatic collections, cholecystectomy may need to be delayed until the inflammatory process and local complications have sufficiently resolved [1,2].

In the presented case, cholecystectomy was planned for reconsideration approximately one month after discharge, depending on the patient's recovery and the status of the collection.

This approach should be evaluated in relation to the final CT findings and the patient's general condition. The presence of a persistent collection may influence the timing of surgery, and the decision should be made jointly by the treating gastroenterologist and surgeon.

9.11. Limitations of the Clinical Case

The present clinical report has several limitations.

First, it describes a single patient and therefore cannot establish the comparative effectiveness of transgastric endoscopic drainage relative to percutaneous or surgical treatment.

Second, the exact type, model, diameter, and length of the metallic stent were not available in the information used to prepare the manuscript.

Third, the detailed CT characteristics of the collection, including the percentage of solid necrotic material and the degree of encapsulation, were not provided.

Fourth, complete laboratory data, including bilirubin, liver enzymes, creatinine, urea, calcium, and CRP values at each time point, were not available.

Finally, the duration of follow-up after discharge, final radiological resolution, stent removal, and completion of cholecystectomy were not documented in the supplied information.

These limitations should be addressed by adding the relevant data from the original medical records. Nevertheless, the case provides a clinically relevant illustration of the role of transgastric drainage and repeated endoscopic cavity clearance in the management of selected patients with persistent peripancreatic collections.

10. Conclusion

Acute gallstone pancreatitis is a clinically heterogeneous disease that requires early diagnosis, accurate assessment of severity, and treatment directed at both the pancreatic inflammatory process and the underlying biliary pathology.

The initial management should include adequate fluid resuscitation, pain control, early nutritional support, correction of metabolic disturbances, and repeated assessment of organ function. ERCP is indicated in patients with acute cholangitis or persistent common bile duct obstruction, but routine urgent ERCP is not recommended in all patients with gallstone pancreatitis.

The development of pancreatic and peripancreatic collections requires careful clinical and radiological assessment. The presence or size of a collection alone does not justify invasive treatment. Drainage is indicated when infection, persistent symptoms, obstruction, nutritional failure, or clinical deterioration is attributable to the collection.

Contemporary management favors minimally invasive step-up strategies. Endoscopic transmural drainage is an effective option for appropriately located collections adjacent to the stomach or duodenum. When drainage alone is insufficient, direct endoscopic necrosectomy may be performed, sometimes requiring repeated sessions to achieve adequate evacuation of residual necrotic material.

The presented clinical case demonstrates the practical application of transgastric endoscopic drainage using a metallic stent, followed by repeated endoscopic evacuation of accumulated fluid and purulent-necrotic material. The substantial reduction in serum amylase and leukocyte count, together with the improvement in CRP and the patient's general condition, indicated a favorable clinical response.

Long-term management should include follow-up imaging, assessment of the drainage tract, appropriate stent removal or exchange, evaluation of pancreatic function, and definitive treatment of gallstone disease. The timing of cholecystectomy should be individualized according to the severity of pancreatitis and the resolution of local complications.

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