

# Pancreatitis (Pancreas Inflammation) — Diagnosis and Surgery

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**Acute pancreatitis is an inflammatory process of the pancreatic tissue with cellular destruction and elevation of serum pancreatic enzymes. The mortality of acute pancreatitis is high especially with necrotizing and infective pancreatitis due to multisystem organ failure. It is the most common cause of gastrointestinal hospitalization in the United States.**



## Epidemiology of Pancreatitis

The per-year frequency of acute pancreatitis is about 40 for every 100,000 adults in the US. Globally, the frequency of the condition ranges between 5 and 80 cases for every 100,000 people.

The occurrence of acute pancreatitis is generally higher in males compared to females. Alcohol is a major cause of the condition in males. Biliary tract disease is the main cause of the condition in females.

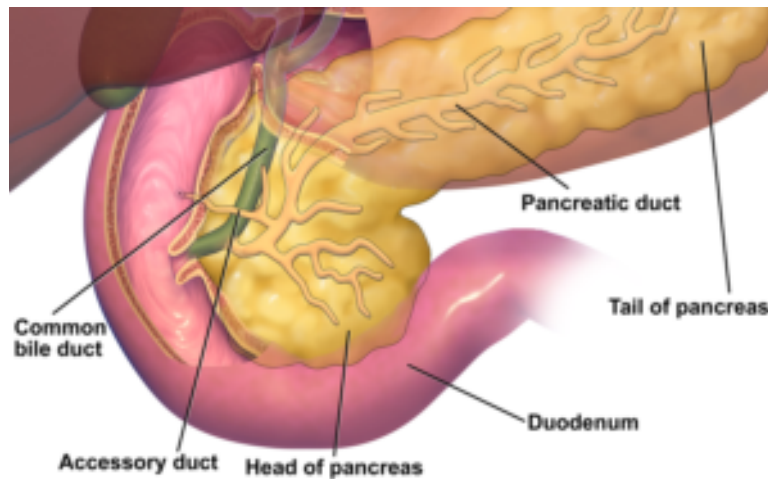


Image: "Anatomy of the pancreas." by Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". Wikijournal of Medicine 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436. - Own work. License: [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)

## Etiology of Pancreatitis

### Gall stones

**Gall stones** obstructing the **ampulla of Vater** is the most common cause of acute pancreatitis. It is believed that the obstruction by **stone** or **edema** from stone passage leads to **backflow of the bile** into the pancreatic duct leading to activation of the pancreatic enzymes and subsequently acute pancreatitis.

**Ascariasis** and **pancreatic or ampullary tumors** can also cause an ampullary obstruction and precipitate pancreatitis. **Cholecystectomy** in patients with gall stones prevents acute pancreatitis and guard against its recurrence.

Gall stones are more common in **middle-aged overweight multiparous females**. Small stones are more likely to pass through the **cystic duct** than the large ones causing an obstruction and acute pancreatitis.

### Alcohol

Alcohol is responsible for up to **30 % of cases** of acute pancreatitis and a major cause of chronic pancreatitis. It is believed that alcohol stimulates pancreatic cells to secrete lytic enzymes which initiate the inflammatory process and induce **autolysis** of the pancreas.

### Hypertriglyceridemia

Elevation of the serum triglycerides levels can precipitate pancreatitis especially with TGL above 1,000 mg/dl. It is common in children with **genetic disorders of lipoprotein metabolism, nephrotic syndrome, obesity, steroid therapy, hypothyroidism** and **diabetes mellitus**.

**Smoking** is a risk factor for many pancreatic diseases including pancreatitis and pancreatic cancer.

## Drugs

Multiple drugs are involved in developing pancreatic inflammation but with good prognosis and low mortality. Common medications associated with pancreatitis include **metronidazole, sulphonamides, valproic acid, Ochterotide, furosemide, didanosine, azathioprine, pentamidine, 6-mercaptopurine, and tetracycline**. The mechanism of inflammation is different but they have a similar clinical presentation.



[Image](#): "Cullen's sign" by Herbert L. Fred, MD and Hendrik A. van Dijk. License: [CC BY 2.0](#)

**Genetic mutations** including the CFTR gene in [cystic fibrosis](#) patients and PRSS1 gene are associated with pancreatitis.

## Miscellaneous causes

- Trauma
- Post ERCP pancreatitis
- Hypercalcemia
- Viral infection, e.g. mumps and cytomegalovirus

## Pathophysiology of Pancreatitis

The Pancreas gland produces insulin and manufactures and secretes digestive enzymes. About 80 % of the pancreases (by weight) is involved in the exocrine function.

The exact pathophysiology for acute pancreatitis is unclear. The current understanding is that both extracellular and intracellular factors contribute to the development of the condition.

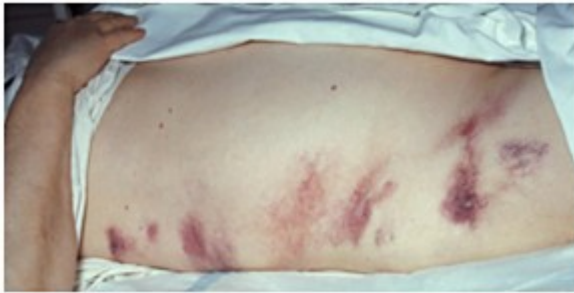
Acute pancreatitis may result from any event that causes injury to the acinar cell and impairs the ability of the pancreas to the secrete zymogen granules.

There is also a possibility of systemic inflammatory response syndrome (SIRS), which leads to systemic shock. In the case of acute pancreatitis, the patient first develops parenchymal edema and peripancreatic fat necrosis; the phenomenon is referred to as acute edematous pancreatitis.

## Clinical Presentation of Pancreatitis

The most characteristic clinical presentation of acute pancreatitis is the **acute onset of severe epigastric abdominal pain** that can be referred to the back and improves with

leaning forward. The pain is severe and associated with **nausea** and **vomiting**. Severe pancreatitis can present with **complications of pleural effusion, adult respiratory distress syndrome,** and **multi-organ failure**.



**Image:** "Grey Turner's sign in hemorrhagic pancreatitis." by Herbert L. Fred, MD and Hendrik A. van Dijk. License: [CC BY 2.0](https://creativecommons.org/licenses/by/2.0/)

General examination of the patients is remarkable for **signs of circulatory collapse** with **hypotension, tachycardia, tachypnea,** and **hypoxemia**. Signs of the causative etiology may be evident in some patients with **scleral icterus** in gall stones, **hepatomegaly** in cases of alcoholism or **parotid enlargement** in case of mumps.

Local examination of the abdomen reveals **distension** and **tenderness** which may be localized to the epigastrium or generalized with ileus and rigidity. **Cullen's sign** is periumbilical ecchymosis while **Turner's sign** is flank ecchymosis and both indicate retroperitoneal hemorrhage in case of **hemorrhagic pancreatitis**.

## Diagnosis of Pancreatitis

### Serum amylase

This is considered a good initial screening test as a result of **elevated pancreatic enzymes** in the serum with acute inflammation. Serum amylase can be elevated more than 3 times normal range early in the course of inflammation and returns back to normal in a few days due to short half-life.

However, elevated serum amylase is not specific for acute pancreatitis as it can also present with **acute cholecystitis, malignancy, renal failure,** and **ectopic pregnancy**. Serum amylase can give false-negative results in case of **alcoholic pancreatitis** or **hypertriglyceridemia** as remarkable serum elevations maybe not evident.

### Serum lipase

This is **more sensitive and specific** than serum amylase and can last longer in the serum of patients after the resolution of symptoms. Nonspecific elevation of lipase is reported in cases of **intestinal obstruction, peptic ulcer, celiac disease,** and **pancreatic tumors**.

### Elevated liver enzymes

ALT and AST are more accurate in diagnosing **gall stone pancreatitis** than alkaline phosphatase level.



[Image](#): "A pancreatic pseudocyst as seen on CT scan" by James Heilman, MD - Own work. License: [CC BY-SA 3.0](#)

## Complications

Local complications include

- [Pancreatic pseudocyst](#)
- Acute necrosis
- Acute peripancreatic fluid collection
- Portosplenomesenteric venous thrombosis
- Infection

## Imaging in Pancreatitis

**Abdominal ultrasound** helps with detection of pancreatic enlargement or edema, fluid collection, and gall stone disease.

**Abdominal CT scan with contrast** can detect the severity and extent of pancreatic inflammation and necrosis if present. It also can help with identifying the etiology of pancreatitis.

**MRI with and without gadolinium enhancement** can detect pancreatic enlargement and necrosis.

**Endoscopic retrograde cholangiogram** can be diagnostic and therapeutic in gall stone pancreatitis. **Papillotomy** can be performed endoscopically in cases where surgery is contraindicated.

## Prognosis of Pancreatitis

Acute pancreatitis can be **mild or severe**. Most patients with mild disease recover in few days while severe disease develops necrosis, organ failure, and the mortality is high. Some patients develop **recurrent or chronic pancreatitis**.

## Management of Pancreatitis

**Acute physiology and chronic health evaluation (APACHE) II score** and **systemic inflammatory response syndrome (SIRS) score** are both used to evaluate the

severity of pancreatitis.

Early nutrition for pancreatitis is advocated and does not impair resolution.

**APACHE score** depends on patient's age and different physiologic variants including PaO<sub>2</sub>, temperature, pulse, mean arterial blood pressure, respiratory rate, conscious level, urine output, serum sodium, serum potassium, PH, serum glucose and calcium.

**Treatment of acute pancreatitis** is mainly **supportive** and depends on the severity of the disease. **ICU admission** is mandatory in cases with high APACHE score and severe disease.

**Fluid resuscitation** of patients to compensate for the fluid loss in the retroperitoneal and intraperitoneal spaces is the initial step in management.

Patients should be followed up with the **measurement of urine output** and **central venous pressure** to ensure optimal hydration. **NPO and parenteral feeding** are initiated as long as the patient complains of abdominal pain and nausea then enteral feeding starting with a liquid diet low in fat can be introduced within the first 48 hours.

**Pain control** with **fentanyl** or **meperidine** is indicated for severe abdominal pain. Morphine should be avoided in cases with gall stone pancreatitis as it increases the pressure of the sphincter of Oddi.

**Antibiotic therapy** is mainly reserved for patients with infection but not for routine administration. **Imipenem** and **cilastatin** are proven effective in penetrating pancreatic tissue and preventing abdominal infection.

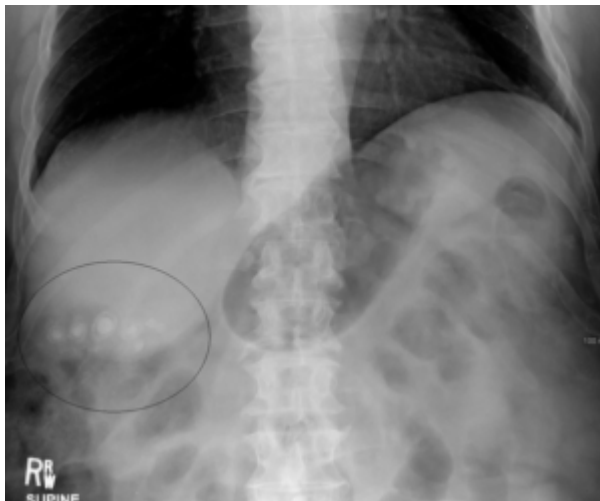


Image: "Gallstones as seen on plain x-ray." by James Heilman, MD - Own work. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

## Surgical intervention

Surgical intervention in acute pancreatitis is reserved for patients with **necrotic pancreatitis** to avoid infection and for **hemorrhagic pancreatitis** that leads to circulatory compromise. In case of infection or pancreatic abscess, **CT guided needle aspiration** is indicated or **percutaneous drainage** otherwise opens surgery with debridement of the necrotic and infected tissues.

**Cholecystectomy** or **endoscopic retrograde intervention** is indicated in gall stone pancreatitis in the same hospital setting to avoid recurrence.

## Pancreatic pseudocyst

One of the complications that can follow acute pancreatitis is **persistent peripancreatic fluid collection** known as [pseudocysts](#). They lack epithelialized wall but are surrounded by adjacent structures such as [pancreas](#), colon, omentum, and stomach.

Pseudocysts are usually **asymptomatic** but sometimes they present with **dull pain** and **dyspepsia**. **Intestinal obstruction** with **nausea** and **vomiting** due to the expansion of large cysts may develop. Digestion of the wall of blood vessels can lead to **pseudoaneurysms** and [GI bleeding](#).

**Pancreatic ascites** and **pleural effusion** from leakage of the pancreatic enzymes in the abdomen or chest through a pancreatic fistula can lead to infection and sepsis. Treatment is usually surgical following control of pancreatic secretions with **octreotide**. Endoscopic drainage of the fluid via **transpapillary approach** or **transmural approach** is used to drain the fluid and prevent recurrence through a stent in the pancreatic duct or communicating the cyst with the small bowel (**transmural enterocystostomy**). Open surgical drainage is used for large pseudocysts by utilizing enteric anastomosis.

## Chronic pancreatitis

Progression of acute pancreatitis or recurrent attacks can lead to chronic pancreatitis with **major structural and functional impairment** of the exocrine and endocrine gland of the pancreas. Complications of chronic pancreatitis include pseudocyst formation, obstruction of the [bile duct](#) which may lead to jaundice and liver cirrhosis, duodenal obstruction with dyspepsia, [portal hypertension](#), splenic vein thrombosis, and endocrine pancreatic insufficiency.

Patients with chronic pancreatitis can develop [diabetes mellitus](#) with fluctuations in blood glucose level. Follow up with serum glucose and HbA1c is indicated to determine diabetic potential and appropriate management. Symptoms of weight loss, [anorexia](#), and abdominal pain should raise the suspicion of **pancreatic adenocarcinoma** in patients with chronic pancreatitis. Serial tumor markers and imaging for early diagnosis of pancreatic cancer are indicated.

Treatment of the patient with chronic pancreatitis starts with **abstinence from alcohol and smoking**. Frequent **small meals** with **medium-chain fatty acids** and **pancreatic enzyme supplements** are dietary modifications to decrease pancreatic stimulation and limit the pain. **Opiates** and **amitriptyline** can be used also to limit the pain and sometimes patients can benefit from **hospitalization** and a **short period of NPO**.

**Surgical treatment** of chronic pancreatitis is directed for pain control and correction of structural complications. Surgical intervention in the form of **total pancreatectomy** or **partial resection of the pancreas** is utilized to relieve intestinal obstruction or treatment of pancreatic cancer. Some patients with consistent pain are a good candidate to **denervation** of the afferent pathways through the celiac ganglion or **radiation therapy**.

Remember the association [hyperparathyroidism](#), [hypercalcemia](#), and pancreatitis.

## References

[Acute Pancreatitis Treatment & Management](#) via medscape.com

[Etiology of acute pancreatitis](#) via uptodate.com

[Clinical manifestations and diagnosis of acute pancreatitis](#) via uptodate.com

[Management of acute pancreatitis](#) via uptodate.com

[Pancreatic Pseudocysts](#) via medscape.com

[Chronic pancreatitis](#) via uptodate.com

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