

## Pancreatitis

The pancreas is a long, flat gland that lies horizontally behind the stomach. This major organ has two critical functions. Its **endocrine** function regulates the *production* of insulin, glucagon, and somatostatin, each with its own essential hormonal activity. Its **exocrine** function manages the *secretion* of proteolytic, lipolytic, and amylolytic enzymes. These three enzymes are necessary for the breakdown of protein, cholesterol, and fat, which allows for the digestion of nutrients.

Normally, the pancreatic enzymes are inactive until they reach the small intestine. However, a variety of factors can disrupt either the secretion of these enzymes or their passage into the intestine. When such a disruption occurs, the enzymes instead begin working in the pancreas and “digest” surrounding pancreatic tissue and blood vessels. The inflammation caused by this auto-digestion is pancreatitis. Pancreatitis can be categorized as **acute** or **chronic**. While the types are similar in etiology, each tends to follow its own clinical course.

### Acute Pancreatitis

Acute pancreatitis (AP) is the acute inflammation of the pancreas, often accompanied by the formation of necrotic areas of pancreatic tissue and, frequently, hemorrhages into the pancreas itself. AP can be categorized as mild or severe based on physical, laboratory, and pathologic findings.

The incidence of AP, as well as the rate of related hospitalizations, is increasing. In the United States, the incidence is up to 44 cases per 100,000 persons — the highest in the world — affecting approximately 80,000 people annually.<sup>1</sup> The incidence increases with age. The majority (~80%) of AP cases are mild; about 10–25% are severe.<sup>1,2</sup> Approximately 80% of AP cases are caused by gallstone disease and alcohol abuse or misuse.

Patients with AP typically present with a sudden or severe upper abdominal pain. It is not uncommon for patients to assume a fetal position in an attempt to relieve the pain. Other signs and symptoms may include hypotension, fever, nausea and vomiting, diminished bowel sounds with abdominal distention, jaundice, tachycardia, and pancreatic edema. Decreased lower lobe breath sounds may be evident due to shallow respirations, pain, and increased abdominal size. Laboratory results suggestive of AP include elevated levels of serum amylase (up to 3 times normal levels), lipase, and glucose, as well as an elevated white blood cell count. Amylase alone is less reliable in determining the presence of pancreatitis because, while it is released within hours of an acute attack, its serum levels return to normal within 2 to 5 days. Serum lipase is a more sensitive indicator of AP because it has a long clearance time and there are fewer nonpancreatic causes of hyperlipidemia. Levels of aspartate

aminotransferase (AST), alanine aminotransferase (ALT), and bilirubin may also be elevated, particularly if alcohol is the precipitating factor.

The following imaging techniques are useful for assessing the severity of AP, differentiating between types of pancreatitis, and determining the presence of associated complications:

- Computerized tomography (CT), which is the imaging study of choice
- Ultrasound, which, while less sensitive than CT scanning, is useful if gallstones are suspected
- Chest X-ray and flat plate of the abdomen, to help rule out other conditions
- MRI, which is also used frequently to visualize damaged areas of the pancreas

Several ranking systems have been developed to assess the severity and outcome of AP as well as to compare the efficacy of different treatment modalities. The most widely used scoring system is Ranson's criteria, consisting of 11 risk factors evaluated upon admission and at 48 hours after admission (see Table 1).

The number of Ranson's criteria present denotes the severity of AP as either mild to moderate (0–2) or severe (3 or more).

Most cases of AP are uncomplicated and resolve spontaneously

in 1–3 days with the return of normal pancreatic function. The development of complications, however, is more ominous both in terms of time to pancreatic function recovery, and the rate of morbidity and mortality. The presence of necrosis, hemorrhage, and infection convey mortality rates of up to 25%, 50%, and 80%, respectively.<sup>2</sup> Severe cases of AP have an associated mortality rate of 7–30%.<sup>2</sup> Surgical intervention may be required if gallstones are determined to be blocking the bile duct, if there is development of a pseudocyst(s) (a collection of exudates around the pancreas that may be connected to the pancreatic duct system), or if multiple organs are involved.

Additional serious complications of AP include pancreatic abscess (a collection of pus in the pancreatic tissue), infected pancreatic pseudocyst, infection of other pancreatic fluid collections, and bleeding from the pancreatic duct. These complications usually develop within 2–5 weeks after the appearance of initial AP symptoms.

Approximately 25% of patients will

Table 1

Ranson's Criteria	
On Admission	
Age >55?	<input type="checkbox"/> Yes + 1
WBC >16 on admission?	<input type="checkbox"/> Yes + 1
Glucose >200 (US) >10 (SI) on admission?	<input type="checkbox"/> Yes + 1
LDH >350 on admission?	<input type="checkbox"/> Yes + 1
AST >250 on admission?	<input type="checkbox"/> Yes + 1
At 48 Hours After Admission	
Hct drop >10% within 48 hours of admission?	<input type="checkbox"/> Yes + 1
BUN increase >5 US (>1.79 SI) within 48 hours of admission?	<input type="checkbox"/> Yes + 1
Ca <8 (US) <2 (SI) within 48 hours of admission?	<input type="checkbox"/> Yes + 1
Arterial pO <sub>2</sub> <60 within 48 hours of admission?	<input type="checkbox"/> Yes + 1
Base deficit (24 - HCO <sub>3</sub> ) >4 within 48 hours of admission?	<input type="checkbox"/> Yes + 1
Fluid needs >6L within 48 hours of admission?	<input type="checkbox"/> Yes + 1

experience a recurrent attack of AP, and an estimated 6% of patients will progress to chronic pancreatitis.<sup>1</sup>

## Chronic Pancreatitis

Chronic pancreatitis (CP) results from recurrent episodes of pancreatic inflammation and leads to scarring and progressive, permanent damage to the anatomy of the pancreas and irreversible compromise of its endocrine and exocrine functions.

The estimated incidence of CP is 6 cases per 100,000 people; the average age of onset is 40–60 years.<sup>1</sup> There are numerous potential causes of CP, but the highest incidence is secondary to chronic alcohol abuse. Although only about 5–10% of people who consume large amounts of alcohol develop CP, 60–80% of patients with CP have a long-standing history of excessive alcohol intake, ranging from 3–5 ounces of alcohol per day over 5–15 years or more.<sup>1,3</sup> Other causes include obstruction (particularly due to gallstones), recurrent AP with fibrosis, or autoimmune disorders. Approximately 20–30% of cases are idiopathic.<sup>1,3</sup>

The two primary clinical manifestations of chronic pancreatitis are abdominal pain and pancreatic insufficiency (endocrine or exocrine; see Table 2). Patients often present with symptoms such as: chronic pain (particularly after eating); steatorrhea (fat in the stool) due to insufficient breakdown of fat, which is a result of decreased lipolytic activity; and nausea and vomiting.

## Pancreatitis-associated Pain

The primary and most common symptom associated with chronic pancreatitis is severe pain, experienced by 50–90% of patients. The pain can be either episodic or intractable (unceasing); the latter can

Table 2

## Pancreatic Insufficiency

### Endocrine insufficiency:

Decreased insulin production, resulting in glucose intolerance.

### Exocrine insufficiency:

Reduced production/secretion of pancreatic enzymes, resulting in impaired digestion.

significantly impact quality of life.<sup>1</sup> Over time, as the condition worsens and pancreatic tissue becomes less viable, the pain may actually abate. Importantly, chronic pancreatitis-related pain is responsible for up to 90,000 hospital admissions in the U.S. per year. It also has a significant, negative impact on quality of life as well as narcotic dependency.

Pain associated with acute pancreatitis is typically limited initially to the duration of the individual episode. The pain of chronic pancreatitis is characterized in several ways, including that it:

- Worsens with eating or drinking
- May be relieved by sitting upright or leaning forward
- Is described as “penetrating” and radiating to the back, or as a continuous dull abdominal pain

Contributors to pain are numerous and include:

- Increased pressure in the pancreatic duct (hypertensive pancreatic duct) as well as around the duct and its branches
- The presence of single or multiple strictures or stones
- Pancreatic tissue inflammation and scarring that can cause a stenosis of the bile duct or duodenum (the stenosis can also contribute to increased pressure)
- Decreased pancreatic blood flow with tissue ischemia as a result of increased tissue pressure

- Damage to, or an increase in the number and size of, pancreatic nerves
- Infiltration of inflammatory or immune cells

Pain treatment depends, in large part, on the type and cause of the pain. Therapeutic options can include prostaglandin inhibitors, acetaminophen, opioids, anticonvulsants, and antidepressants, as well as octreotide, which decreases pain by suppressing pancreatic secretions. Some patients may require a more invasive approach using steroid blocks, infusion of local anesthetic to the celiac plexus neurolytic region, or epidural/intrathecal therapies.

## Nutrition in Pancreatitis

Nutritional status (which may include, for instance, malnutrition commonly associated with alcoholism, or obesity) critically impacts prognosis, including at the onset of AP.<sup>4</sup> Nutritional status must be assessed at the time of diagnosis and reevaluated throughout the course of care. This is especially important because during an episode of pancreatitis, a patient experiences a catabolic stress state, which causes the breakdown of skeletal muscle.

Given that pancreatitis results from secretion and pooling of pancreatic enzymes, standard practice historically included resting the pancreas in order to minimize enzyme production. Thus, most patients with AP were maintained NPO. More recently, however, it has been recognized that not using the gut is itself stressful and may prolong the duration and severity of the inflammation, diminish gut integrity, and lead to additional complications. Current nutrition support guidelines for AP recommend that:

- Specialized nutrition support (SNS) is generally not needed for

mild-to-moderate disease unless complications ensue.

- SNS should be considered for any patient regardless of disease severity if it becomes evident that the patient will not be able to tolerate an anticipated NPO duration of more than 5–7 days for adults, or more than 3–5 days for children.
- To avoid calorie deficits, SNS should be provided earlier in a patient who presents at the time of diagnosis in a malnourished state, especially if the patient is critically ill.
- Early SNS — within 24–48 hours of diagnosis — is indicated for severe pancreatitis, primarily in the form of enteral (tube-fed) therapy.
- SNS is useful in the management of patients who develop complications of surgery.
- Parenteral nutrition may be indicated, particularly when enteral nutrition is contraindicated or not well tolerated.<sup>5,6</sup>

With CP, the nutritional situation is somewhat different. Weight loss is a common nutritional disorder, as patients may: avoid eating in anticipation of pain, develop diabetes with increasing endocrine insufficiency, have ongoing steatorrhea, or have ongoing or renewed alcohol consumption or narcotic addiction. Patients with CP should follow a diet that is high in calories and protein, with a low-to-moderate fat intake.

Impaired glucose tolerance develops in 40–90% of CP patients, with type I diabetes developing in 20–30% as a late manifestation.<sup>7</sup> For these patients, it is important to avoid concentrated sweets in order to control serum glucose levels.

As CP progresses, pancreatic enzyme secretion slows significantly

and may cease. Patients must then take oral pancreatic enzymes with meals to improve digestion and absorption (as well as promote pain relief). Dosing of these enzymes occurs in accordance with meal composition and volume. Fat-soluble vitamins (A, D, E and K) will also be malabsorbed and supplements will be necessary. Also, patients with a history of alcohol abuse will likely require additional folic acid, thiamine, and vitamins B6 and B12.

## Antibiotic Therapy in Pancreatitis

Current clinical guidelines from the American College of Gastroenterology recommend that antibiotics not be prescribed in cases of mild acute pancreatitis. For severe pancreatitis with suspected or proven infected necrotic pancreatic tissue, a limited course of antibiotics may be indicated. When considering prophylactic antibiotic therapy, use should be reserved for patients at high risk of infection, such as those with more than 30% necrotic pancreatic tissue. Antibiotics that can penetrate pancreatic tissue include imipenem-cilastin (Primaxin® I.V.) or ciprofloxacin (Cipro®) plus metronidazole (Flagyl®) and may be appropriate for use.<sup>8</sup>

## Surgical Intervention in Pancreatitis

Surgery may be indicated in situations including:

- The presence of a large pancreatic abscess, infected pancreatic necrosis, and/or pancreatic pseudocysts that are symptomatic or larger than 7 cm
- The presence of infected or necrotic pancreatic tissue
- The presence of peritonitis, impacted gallstones, or drainage of pancreatic fluid collections

## Site-of-Care Options

Current healthcare priorities include appropriate resource utilization, one component of which is site of care. Given the high incidence of hospital admissions, readmissions, and emergency department visits associated with pancreatitis patients, it is both prudent and necessary to consider the most appropriate site of care. Pain management, nutrition support, and anti-infective therapies — all of which may be required by pancreatitis patients — can be provided cost-effectively in the home, supporting positive clinical, economic and quality-of-life outcomes for these patients. ♦

*\*Do not use the information in this article to diagnose or treat a health problem or disease without consulting a qualified physician. Patients should consult their physician before starting any course of treatment or supplementation,*

*particularly if they are currently under medical care, and should never disregard medical advice or delay in seeking it because of something set forth in this publication.*

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## Self-Assessment Quiz: Pancreatitis

### LEARNING GOAL

To understand the clinical complexities and treatment options for acute and chronic pancreatitis.

### LEARNING OBJECTIVES

At the end of this program, the reader will be able to:

1. Describe the pathophysiology of and risk factors associated with pancreatitis.
2. Discuss diagnostic studies and parameters used to diagnose pancreatitis.
3. Discuss the rationale for treatment strategies.

### SELF-ASSESSMENT QUESTIONS

**In the Quiz Answers section on the next page, circle the correct answer for each question. To obtain two (2.0) contact hours toward CE credit, the passing score is 100%.** Return your Self-Assessment Quiz to Coram via email, fax or mail. See the next page for details on how to return to your quiz. Please allow approximately seven days to process your test and receive your certificate upon achieving a passing score.

1. The primary function(s) of the pancreas is (are):
  - a. Endocrine: regulates the production of insulin, glucagon and somatostatin
  - b. Exocrine: controls the secretion of proteolytic, lipolytic, and amylolytic enzymes, which are necessary for the breakdown of protein, cholesterol and fat, allowing for the digestion of nutrients
  - c. A and B
2. The majority of AP cases are mild.
  - a. True
  - b. False
3. The primary cause(s) of acute pancreatitis is (are):
  - a. Gallstone disease
  - b. Alcohol abuse
  - c. A and B
4. Patients with acute pancreatitis typically present with gradual onset of upper abdominal pain.
  - a. True
  - b. False
5. Chronic pancreatitis results from recurrent episodes of acute pancreatitis.
  - a. True
  - b. False
6. Damage to pancreatic function in chronic pancreatitis is irreversible.
  - a. True
  - b. False
7. Primary clinical manifestations of chronic pancreatitis include:
  - a. Abdominal pain and pancreatic insufficiency
  - b. Glucose intolerance
  - c. Steatorrhea
  - d. A and C
  - e. All of the above
8. The following are true for the pain of chronic pancreatitis EXCEPT that it:
  - a. Is the most commonly associated symptom
  - b. Is always intractable
  - c. May lessen as pancreatic damage worsens
  - d. Worsens with eating or drinking
  - e. Is responsible for many hospital admissions/readmissions
9. The following statement is TRUE — Nutrition therapy should be considered:
  - a. For all patients on pancreatic rest
  - b. Only in cases of severe disease
  - c. For an adult patient likely to be NPO for 5–7 days
  - d. Initially in the form of parenteral therapy for patients with severe disease
10. Prophylactic antibiotics are currently recommended for all patients with acute pancreatitis in order to prevent infection.
  - a. True
  - b. False

# Healthline

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## Pancreatitis

### QUIZ ANSWERS

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- 2.
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