Investigating acute pancreatitis

Each month we present authoritative advice on the investigation of a common clinical problem, specially written for family doctors by the Board of Continuing Medical Education of the Royal Australasian College of Physicians.

SEAN P. GRIFFIN
BMedSc, MB BS
PAUL S. HABER
MD, FRACP

Dr Griffin is a Gastroenterology and Liver Transplant Registrar at Royal Prince Hospital, Sydney;
Dr Haber is the Medical Head of the Drug and Alcohol Department at Royal Prince Alfred Hospital, Sydney, NSW.

Series Editor
CHRISTOPHER S. POKORNY
MB BS, FRACP

Dr Pokorny is Honorary Secretary, Board of Continuing Education, Royal Australasian College of Physicians, and a gastroenterologist in private practice, Sydney, NSW.

The hallmark of acute pancreatitis is inflammation of the pancreas, typically manifesting with severe upper abdominal pain. Recent studies support the concept of autodigestion in which activation of trypsin induces a cascade of digestive enzyme activation leading to pancreatic tissue injury. This injury stimulates an inflammatory response via pro-inflammatory cytokines. Most cases of acute pancreatitis are mild and settle in a few days; however, 20% of cases are severe, with local or systemic complications, and carry a high mortality rate despite intensive care or surgical intervention. It is important for general practitioners to consider pancreatitis in all cases of acute abdominal pain, as diagnostic delay may increase the chance of a poor outcome. All patients with confirmed acute pancreatitis should be referred (and admitted) to hospital without delay.

IN SUMMARY

- **In Australia, the most common causes of acute pancreatitis are gallstones and alcohol.**
- **The key initial investigations are a serum amylase level, a full blood count and liver function tests.**
- **The dynamic contrast-enhanced abdominal CT is the investigation of choice for local complications.**
- **All patients with confirmed acute pancreatitis should be referred (and admitted) to hospital without delay.**

Table 1. Acute pancreatitis in Australia: common causes

- Gallstones (40%)
- Alcohol (40%)
- Idiopathic causes (10%)
- Other conditions (10%):
  - pancreatic duct obstruction (tumours, pancreas divisum, rarely in cystic fibrosis)
  - metabolic (hypercalcaemia, hyperlipidaemia, uraemia)
  - trauma
  - iatrogenic (ERCP, surgery)
  - infections (e.g. mumps)
  - drugs (e.g. didanosine, azathioprine).

Diagnostic process

Pancreatitis presents almost universally with constant central abdominal pain usually radiating to the back. This unrelenting pain often mimics a surgical abdomen and is associated with severe nausea and vomiting. The patient appears ill with fever and with upper abdominal signs of tenderness, guarding and rebound. The pain tends to exceed the physical signs and boardlike rigidity is uncommon.

Once pancreatitis is suspected on the basis of the above clinical picture, investigation is directed concurrently at:

- confirming the diagnosis
- excluding other causes of acute abdominal pain
- establishing severity
- elucidating aetiology.

Case 1. Mild acute pancreatitis secondary to common bile duct obstruction

A 44-year-old woman presented with epigastric pain. On initial investigation, the following results were obtained: serum amylase level, 1,483 U/L; serum bilirubin level, 65 mmol/L (normal, less than 17 mmol/L); serum alkaline phosphatase level, 375 U/L (normal, less than 110 U/L) and serum gamma glutamyl transferase level, 270 U/L (normal, less than 50 U/L). Abdominal CT (below) demonstrated an enlarged gallbladder with a thickened wall, a dilated common bile duct, an enlarged pancreas and peripancreatic fluid, representing a grade C lesion (see the box on page 80). The patient settled with conservative measures. Subsequently, elective cholecystectomy was performed and numerous small gallstones were found.

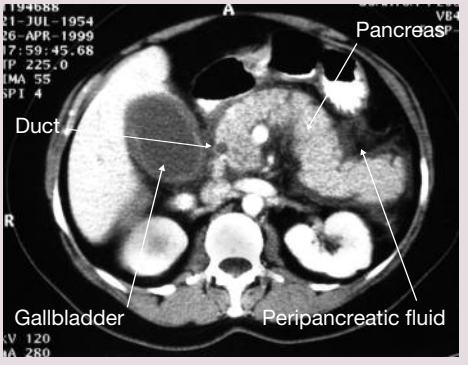

Figure A. Mild pancreatitis secondary to common bile duct obstruction.

Case 2. Severe alcoholic acute pancreatitis

A 63-year-old woman with a very heavy ethanol intake presented with a three-day history of severe upper abdominal pain. Investigations revealed the following: serum amylase level, 1,439 U/L; serum lipase level, 4,269 U/L; normal liver function tests; white cell count, 3.0 x 109/L; serum haemoglobin level, 72 g/L; arterial pH, 7.14; serum blood sugar level, 13 mmol/L; and corrected serum calcium level, 1.70 mmol/L. Abdominal CT (see below) revealed a grossly enlarged oedematous pancreas (arrows) and bilateral pleural effusions (not shown) representing a grade E lesion (see the box on page 80). The patient required admission to the intensive care unit.

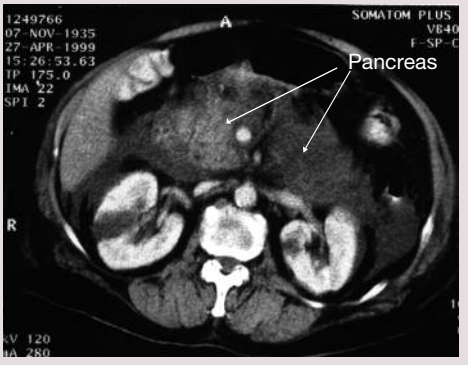

Figure B. Severe alcoholic pancreatitis.

There are a variety of aetiologies for acute pancreatitis – the major causes in Australia are listed in Table 1.

Initial investigations

The following blood tests and imaging studies comprise the initial investigations in suspected acute pancreatitis.

Blood tests

Serum amylase

Serum amylase assay remains the most useful blood test to diagnose acute pancreatitis. Levels:

- are greater than three times normal in most cases (normal, less than 100 U/L)
- rise within hours of onset and return to normal in two to three days
- do not correlate with disease severity.

A false negative result may occur in many acute exacerbation of alcoholic pancreatitis, or when testing is undertaken too early or too late in the disease. A false positive result may be obtained in acute abdominal conditions (e.g. acute cholecystitis, perforated peptic ulcer, intestinal infarction), ectopic pregnancy, renal failure and in salivary disease.

Persistent elevation of the serum amylase level suggests development of a pseudocyst.

Full blood count

Neutrophilia and decreases in serum haemoglobin level or haematocrit correlate with disease severity. A low platelet count may indicate the presence of complicating disseminated intravascular coagulation (DIC).

Electrolytes and liver function tests

An increased serum alanine aminotransferase (ALT) level and cholestatic liver function tests (raised serum bilirubin, alkaline phosphastase [ALP] and gamma glutamyl transferase [γGT] levels) suggest gallstones as the cause of acute pancreatitis. Elevated serum levels of urea and creatinine suggest dehydration and/or severe disease.

Serum lipase

A serum lipase level is only helpful in occasional cases (normal, less than 190 U/L). In acute pancreatitis, it remains elevated for longer than

the amylase level. Also, it is more specific than amylase for pancreatitis, with 95% of serum lipase being of pancreatic origin; however, false positives still occur.

Imaging studies

Abdominal CT

If the diagnosis is uncertain or if severe pancreatitis is suspected, abdominal CT should be undertaken. Abdominal CT is sensitive and specific in identifying pancreatic enlargement and inflammatory exudate around the pancreas and thus can provide supportive evidence for a diagnosis of acute pancreatitis. Intravenous contrast enhancement allows detection of poorly perfused areas of the pancreas that are likely to be necrotic.

Abdominal CT is the most useful investigation in assessing severity of disease (see the Cases) and a grading system has been devised that correlates well with outcome (see the box on page 80 and Cases 1, 2 and 4).

Abdominal and chest x-rays

Plain x-rays are usually performed to exclude the presence of gas under the diaphragm, the pathognomonic sign of gastrointestinal perforation. There are several suggestive radiological signs of acute pancreatitis: generalised ileus, sentinel loop (localised jejunal dilatation) and calcified cholelithiasis. (Pancreatic calcification, indicative of chronic pancreatitis, may be seen on plain radiology, but is more readily seen on CT [see Case 4].)

Abdominal ultrasound

The pancreas is often poorly visualised on abdominal ultrasound. Ultrasonography is performed to detect gallstone disease (choledocholithiasis and/or common bile duct dilatation). It also plays a role in monitoring pseudocyst size.

Assessing severe disease

The severity of acute pancreatitis can be predicted by a good clinical assessment analysing the history, physical signs and the results of initial investigations (particularly abdominal CT). Findings in severe acute pancreatitis, on both initial and further investigation, are outlined below.

Blood tests

Arterial blood gases

Third space sequestration and respiratory failure lead to shock and hypoxia causing acidosis.

Coagulation studies

The presence of disseminated intravascular coagulation indicates severe disease. Features include:

- a rising international normalised ratio (INR)
- a falling platelet count
- a rising plasma level of fibrin degradation products (including d-dimer).

Blood glucose

Transient pancreatic endocrine dysfunction may lead to diabetes mellitus.

Case 3. Pseudocyst complicating alcoholic pancreatitis

A 61-year-old alcoholic man presented with severe abdominal pain. Investigations revealed: serum amylase level, 2,518 U/L; normal liver function tests; white cell count, 20 x 10^9/L; arterial pH, 7.36; blood sugar level, 7.1 mmol/L; and a normal chest x-ray. Abdominal CT (see below) revealed a pseudocyst in the body of the pancreas. The tail of the pancreas was normal. The pseudocyst was managed conservatively and resolved completely over three months.

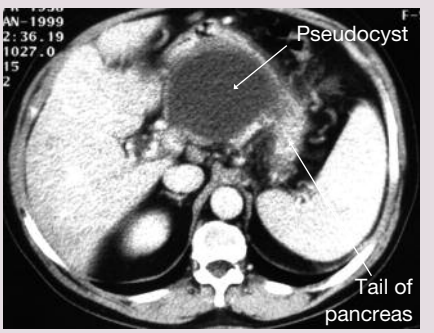

Figure C. Pseudocyst complicating alcoholic pancreatitis.

Case 4. Mild acute exacerbation of chronic pancreatitis

A 70-year-old woman with previous alcoholic pancreatitis had been abstinent for two years but developed epigastric pain after consuming one bottle of wine on a single occasion. Her serum amylase level was 60 U/L and abdominal CT scan (see opposite) revealed calcification and enlargement of the head of the pancreas, representing a grade B lesion (see the box on page 80). The patient recovered uneventfully.

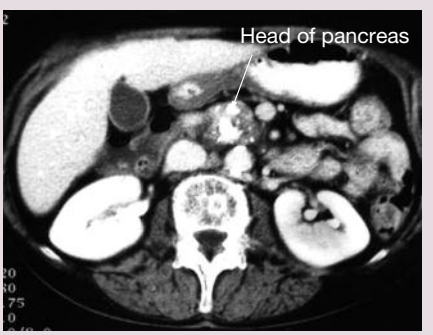

Figure D. Mild acute exacerbation of chronic pancreatitis.

Investigating acute pancreatitis: the dynamic contrast-enhanced abdominal CT scan

There is a close correlation between morbidity – local or systemic complications of pancreatitis – and the severity of pancreatitis demonstrated by CT scan. Table A shows a CT grading system for acute pancreatitis. Table B shows the relationship between the extent of pancreatic necrosis and morbidity.

Table A. CT grading system for acute pancreatitis

Grade	Findings	Morbidity (%)
A	Normal	0
B	Focal or diffuse pancreatic enlargement (changes restricted to pancreas)	0
C	Peripancreatic changes (without fluid collection)	7
D	Single extraperipancreatic fluid collection	42
E	Two or more fluid collections or gas in or around the pancreas	60

Table B. Pancreatic necrosis and morbidity

Necrosis	Percentage of pancreas failing to enhance	Morbidity (%)
None	None	12
Mild	0 to 30%	40
Moderate	30 to 50%	75
Extensive	More than 50%	100

Serum calcium

The serum calcium level decreases with more severe disease.

Imaging studies

Chest x-ray

Pulmonary infiltrates from respiratory distress syndrome are seen in severe cases of acute pancreatitis and pleural effusions may occur.

Abdominal CT

Abdominal CT scanning is fundamental to assess the severity of and to diagnose the major local complications – necrosis, pseudocyst and abscess (see Cases 1, 2 and 3). The investigation of choice is the dynamic contrast - enhanced CT scan.

ERCP

Endoscopic retrograde cholangiopancreatography (ERCP) has the unique role in acute pancreatitis of visualising and removing gallstones from the common bile duct. Used in this way, ERCP has been shown to reduce the morbidity of severe nonresolving gallstone pancreatitis. (ERCP also has a significant role in chronic pancreatitis in establishing the diagnosis and detecting potentially treatable pancreatic strictures.)

Endoscopic ultrasound

Endoscopic ultrasound is sensitive for the identification of choledocholithiasis and in the evaluation of lesions of the head of the pancreas. This test is not widely available at present.

Magnetic resonance imaging

Magnetic resonance imaging (MRI) gives similar results to CT in acute pancreatitis. It is not readily available in Australia. Magnetic resonance cholangiopancreatography (MRCP) is a new MRI-based technique for noninvasive assessment of the biliary tree and pancreatic ducts in cases where ERCP may otherwise have been performed. MRCP may contribute to diagnosis and assessment of disease severity but, unlike ERCP, does not permit therapeutic intervention.

Follow up

Following discharge from hospital, some patients may need ongoing investigation to assess resolution of pancreatitis and to exclude new complications. The most common local complication is a pseudocyst and this can be assessed and monitored by abdominal ultrasound or CT (see Case 3). A full blood count and serum amylase assay often proves useful in this situation, too.

Conclusion

The first step in diagnosing pancreatitis is to suspect the diagnosis. The key initial investigations are serum amylase assay, a full blood count and liver function tests. Detailed assessment and supportive measures are then required as an inpatient – the abdominal CT scan plays a central role at this stage. Admission to hospital is necessary for the management of acute pancreatitis. Outpatient follow up by the family doctor may involve ongoing investigations to detect and manage new complications, most commonly the formation of a pseudocyst. MT