RADIOLOGICAL CASE

CLINICS IN DIAGNOSTIC IMAGING (3)

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CASE REPORT

A 49-year-old man presented with increasing confusion and drowsiness over one week. He also complained of vomiting, nausea and epigastric pain. He was a heavy drinker, chronic smoker and was unable to give a good medical history.

On examination, the patient was febrile, dehydrated, tachypnoeic and hypotensive. He had epigastric tenderness on palpation, but no abdominal guarding. Serology performed showed: glucose 17.2 mmol/l, calcium 1.83 mmol/l, sodium 126 mmol/l, potassium 6.3 mmol/l and arterial blood gases were pH 6.865, PaO_2 20.4kPa, $PaCO_3$ 1.3kPa, HCO_3 1.8mmol/l. Serum amylase, initially 223 U/ml, rose to 3180 U/ml the next day.

Plain radiograph of the abdomen on admission (Fig 1), and subsequent abdominal computed tomography (CT) (Fig 2) and endoscopic retrograde cholangiopancreatogram (ERCP) (Fig 3) were performed. What do these show? What is the diagnosis? How does it relate to the clinical and biochemical findings?

Fig 1 – Plain abdominal radiograph

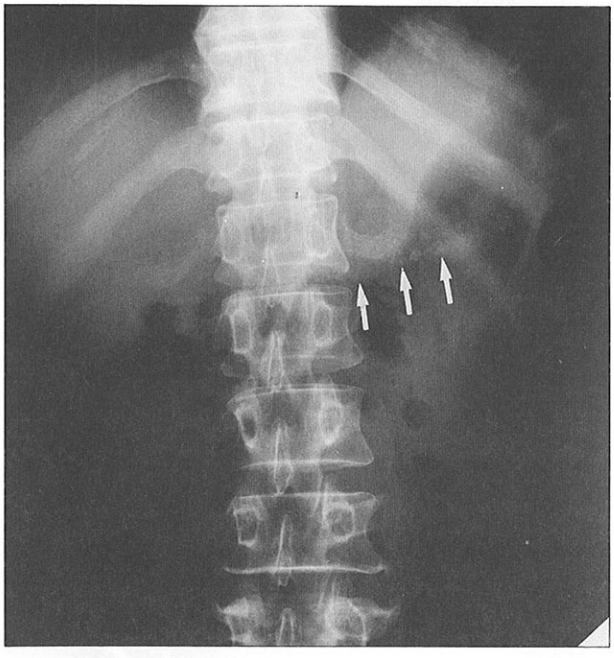

Fig 2 – CT of the upper abdomen

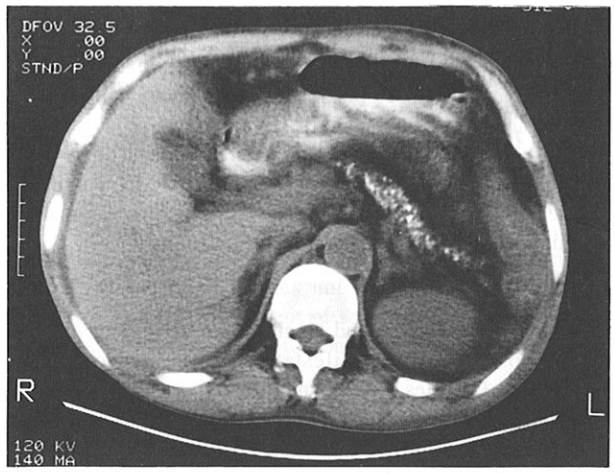

Fig 3 – ERCP – anteroposterior view

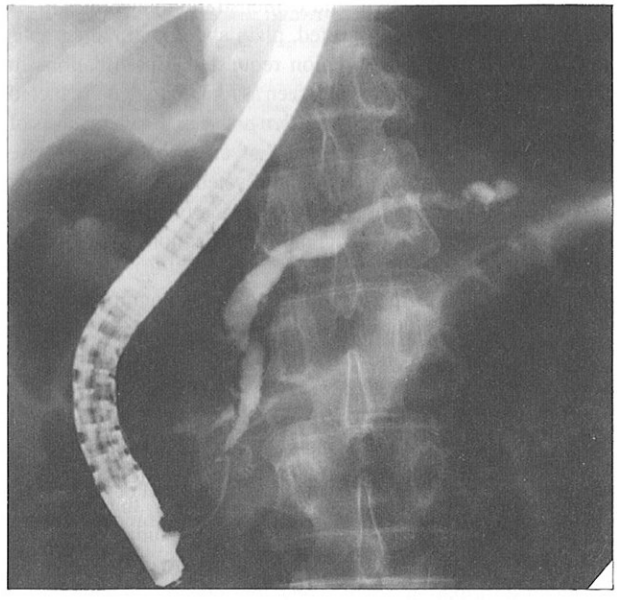

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IMAGE INTERPRETATION

Radiograph (Fig 1) showed speckled calcifications distributed linearly over the epigastric region, corresponding to the shape of the pancreas (arrows). CT (Fig 2), performed to exclude an intra-abdominal collection, confirmed location of the calcifications within the body and tail of an atrophic pancreas. ERCP (Fig 3) demonstrated changes of chronic pancreatitis, manifested as irregular dilatation and strictures, giving the pancreatic duct a somewhat beaded appearance.

Diagnosis: Acute-on-Chronic Pancreatitis causing Diabetic Ketoacidosis

Clinical Course

The patient was stabilised with intravenous (IV) fluid resuscitation including IV bicarbonates, IV antibiotics, dopamine infusion and insulin treatment. He responded well enough to this conservative treatment to be discharged from hospital three weeks later. The patient was readmitted after a period of 9 months for another episode of epigastric pain. He is currently receiving daily insulin injections for control of diabetes mellitus.

DISCUSSION

The patient had clinical and biochemical findings of diabetic ketoacidosis[1], with manifestations of concurrent acute pancreatitis. Diabetes mellitus in this case was almost certainly secondary to exocrine pancreatic insufficiency from chronic alcoholic pancreatitis. Plain abdominal radiographs are of limited value in acute pancreatitis, though subtle findings such as the colon 'cut-off' sign, sentinal loops, the inverted '3' sign, duodenal ileus and localised collection of gas bubbles have been described. Plain films are however valuable for excluding a bowel obstruction or perforation, and demonstrating gallstones[2,3]. If chronic pancreatitis is suspected, plain abdominal radiographs should be the first investigation requested. Calcifications in chronic pancreatitis are typically seen as rounded calculi scattered in line with the duct system, a pattern not seen in other causes of pancreatic calcification. Presence of calcifications in these afflicted patients imply severe ductal system damage, with only about 5% of cases having normal exocrine function. Localised displacement of existing pancreatic calcifications may indicate cyst formation or tumour[2].

Pancreatic abnormality is recognised sonographically by alterations in contour, texture or attenuation. However, in acute pancreatitis, ileus may prevent visualisation of the pancreas and account for most failures[2]. Moreover, the pancreas has a normal appearance in about one-third of cases of mild acute pancreatitis[3]. Ultrasound features that may be seen are: gland enlargement with reduced echogenicity, heterogenous echogenicity, dilatation of the pancreatic duct, thickening of adjacent soft tissues and fluid collections from exudation or tissue necrosis[3,4]. About half of the acute attacks are complicated by pseudocyst formation[2], which develops one to four weeks after onset. Eighty-five percent of pseudocysts are located in the body or tail, and 15% in the head of the pancreas[5]. Ultrasound is reliable in detection of pseudocysts; it can be used to guide drainage procedures and may be performed serially to monitor progress or resolution of pseudocysts. It is difficult to make a diagnosis of chronic pancreatitis on ultrasound, especially in mild and moderate disease. In severe chronic pancreatitis, the gland is small in size, has ill-defined margins and may contain scattered

Fig 4 – CT of a 40-year-old woman with acute pancreatitis. The whole of the pancreas is swollen with indistinct margins (arrowheads). There is also peripancreatic fluid collection (arrows).

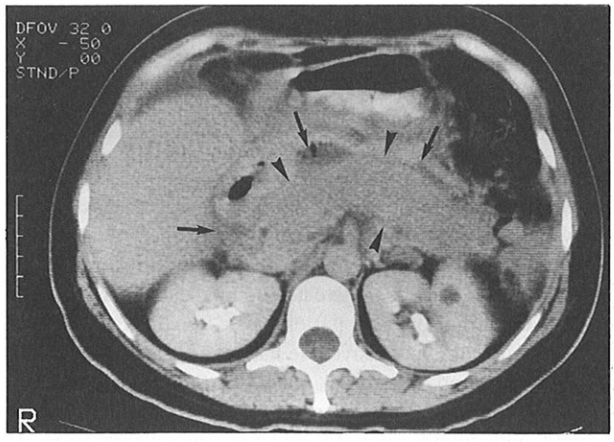
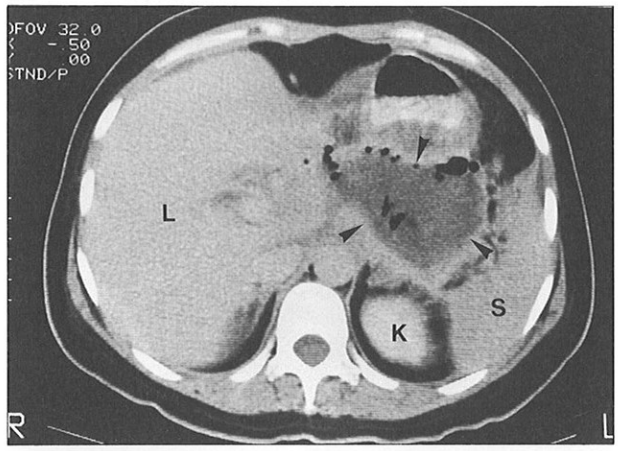


Fig 5 – CT of a 40-year-old woman with pancreatitis complicated by abscess formation. (a) Abscess in the region of the pancreatic tail is detected as a collection of fluid with pockets of air (arrowheads), (b) Repeat scan 3 weeks after percutaneous insertion of a drainage catheter (arrows) shows resolution of the abscess. [S=spleen, L=liver, K=kidney}.

(a)



(b)

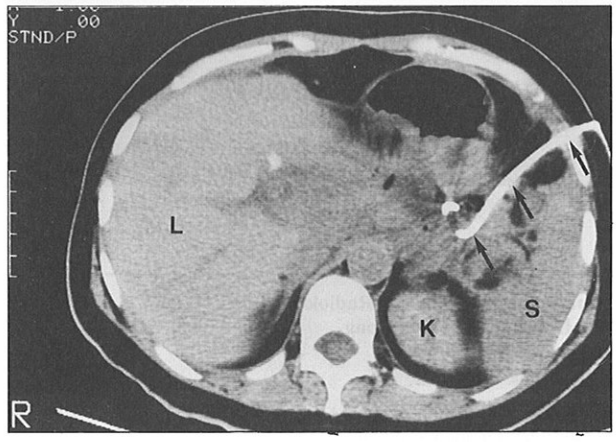
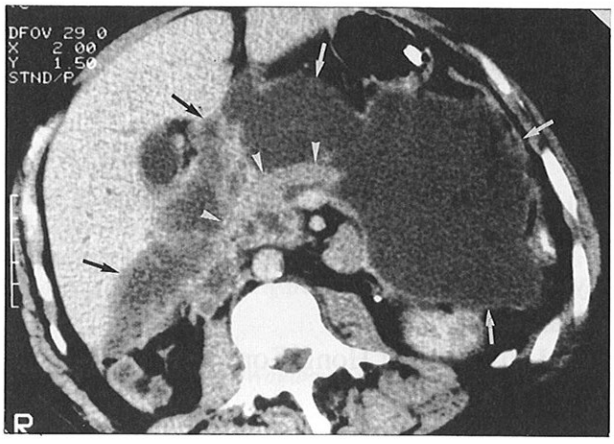


Fig 6 – CT of a 35-year-old woman with pancreatitis complicated by pseudocyst, which is seen as a large fluid collection (arrows) surrounding the remnant pancreas (arrowheads).



areas of increased echogenicity. These echogenic areas may represent calcifications or fibrofatty infiltration of old age. The main pancreatic duct may be dilated and strictured[2-4].

CT of the pancreas is generally accepted as the most reliable method for imaging pancreatic anatomy and major pathology[3]. CT should be performed early in the diagnostic workup of clinical pancreatic insufficiency if plain radiographs and ultrasound do not detect an abnormality. In acute oedematous pancreatitis, the pancreas may be swollen, its density inhomogenous and its margins indistinct on CT (Fig 4). Other common findings are thickening of the adjacent retroperitoneal fascia and peripancreatic effusions. Complications such as tissue necrosis, haemorrhage, pseudocyst, phlegmon, abscess, pseudoaneurysm, bowel loop fistulae and pneumatoses are well demonstrated by CT (Figs 5 and 6). Dynamic CT may reveal a vessel in the wall of a pancreatic cyst, necessitating surgical instead of percutaneous drainage in order to avoid potential massive haemorrhage[6,7]. In chronic pancreatitis, ductal dilatation is a very common feature. CT is the most accurate way of detecting pancreatic calculi, with its presence practically diagnostic of chronic pancreatitis. Pseudocysts in chronic pancreatitis are usually mature, unilocular and relatively stable[6].

The role of ERCP in pancreatic disease is to further clarify pancreatic abnormality demonstrated on ultrasound and CT, or to further investigate suspected lesions where ultrasound and CT are normal or technically unsatisfactory. The pancreatographic hallmarks of chronic pancreatitis are dilatation and beading of the pancreatic duct and its branches, complete or incomplete main duct blockage, small communicating cavities and intraductal calculi[3]. The visualisation of the pancreas on magnetic resonance imaging (MRI) depends much on presence of surrounding contrasting tissue such as peripancreatic fat and fluid-filled stomach and duodenum. Acute pancreatitis produces decreased signal intensity on T1-weighted and increased signal intensity on T2-weighted images, but these changes do not reliably predict the degree of inflammation. Complications of pancreatitis such as pseudocyst and haemorrhage are often more easily detectable than pancreatitis itself[8]. In chronic pancreatitis, loss of signal intensity on T1-weighted fat-suppressed spin-echo images and diminished, heterogeneous contrast enhancement on dynamic post-contrast images are said to reflect replacement of pancreatic glandular tissue by fibrosis. MRI may be more sensitive than CT in identifying the early fibrotic changes of chronic pancreatitis[9]. Although a recent study has shown that contrast enhanced MRI does not differ significantly from dynamic CT in the assessment of severe acute pancreatitis[10], MRI is unlikely to replace CT for routine imaging of the pancreas in the near future.

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ABSTRACT

A 49-year-old man presented with clinical and biochemical features of diabetic ketoacidosis and concomitant acute pancreatitis. Plain radiographs, computerised tomography (CT) and endoscopic retrograde cholangiopancreatogram demonstrated changes of chronic pancreatitis, which was the cause of exocrine pancreatic insufficiency in this patient. Advantages and disadvantages of various imaging modalities in the diagnosis and management of pancreatitis are discussed. Imaging features of acute and chronic pancreatitis, and associated complications, are described.

Keywords: *abdominal calcification, diabetes mellitus, diabetic ketoacidosis, pancreas, complications, pancreatitis*