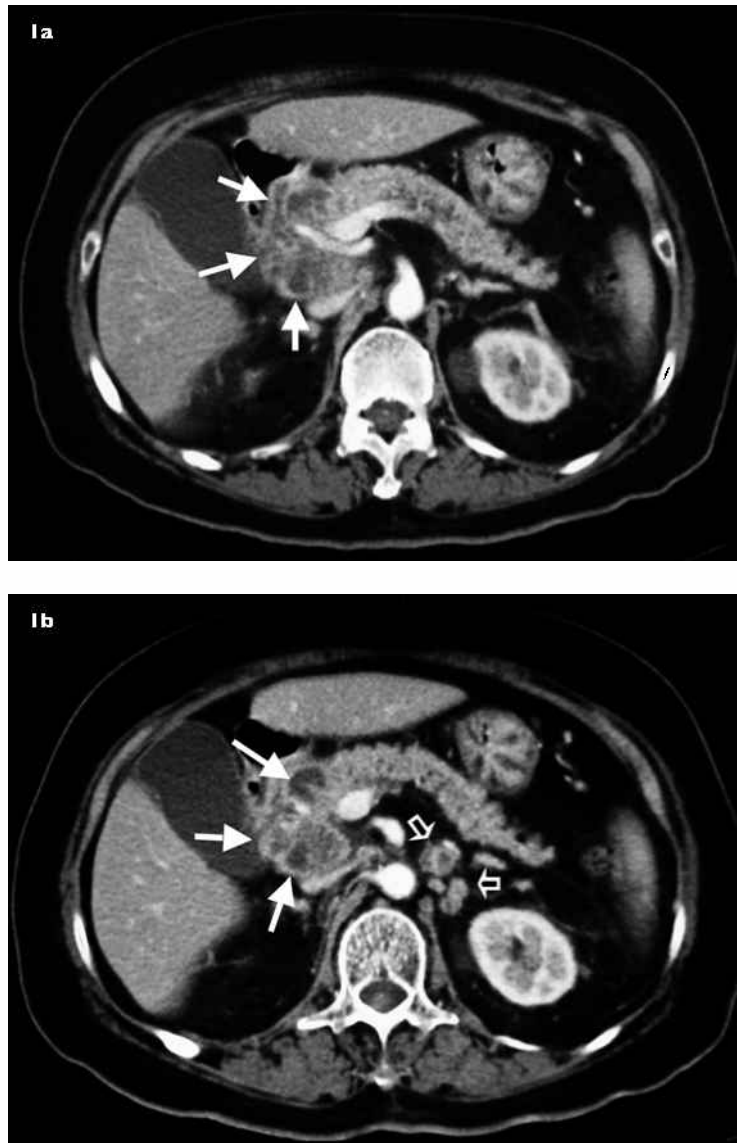


CME Article**Clinics in diagnostic imaging (II7)**

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Figs. 1a & b Consecutive contrast-enhanced axial CT images of the upper abdomen taken at the level of pancreas.

CASE PRESENTATION

A 76-year-old Chinese woman presented with a five-day history of fever and abdominal pain. She had a background history of diabetes, hypertension, hyperlipidaemia, ischaemic heart disease and renal impairment. She was treated for pulmonary tuberculosis 30 years ago. Clinical examination was unremarkable, other than pyrexia of 38°C. At admission, her total white cell count was raised (18.5×10^9 cells/ μ L), as was her

erythrocyte sedimentation rate (ESR) (146 mm/h) and C-reactive protein (13.7 mg/dL). Her serum amylase, biochemical profile and liver function tests were within normal limits. The urine culture grew *Candida albicans*. She was treated, as having a urinary tract infection with intravenous antibiotics, but her fever persisted. Her chest x-ray was normal. Computed tomography (CT) of the abdomen was performed. What do these images show (Figs. 1a & b)?

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IMAGE INTERPRETATION

The CT images of the upper abdomen show a cystic mass at the head and uncinate process of the pancreas (Figs. 1a & b). Peripancreatic and para-aortic lymph nodes are noted (Fig. 1b), and some of them show necrosis. There is no stranding of the adjacent peripancreatic fat; neither is there any peripancreatic fluid or pancreatic pseudocyst formation.

DIAGNOSIS

A complex pancreatic head mass with necrotic areas and peripancreatic lymph nodes. The differential diagnoses for this would include an inflammatory mass or a cystic neoplasm.

CLINICAL COURSE

In view of the clinical picture favouring sepsis and the patient's high operative risk, endoscopic ultrasonography (EUS) was performed. This showed a septated cystic mass in the pancreatic head with a normal main pancreatic duct and common bile duct. Multiple enlarged lymph nodes were seen adjacent to the mass (Fig. 2). EUS-guided fine-needle aspiration (FNA) of the mass was done and this revealed pus. Acid-fast bacilli were seen in the cell block material retrieved from the needle washings. A diagnosis of the pancreatic tuberculous abscess was made and the patient was started on antituberculous medication of isoniazid, rifampicin and pyrazinamide, with rapid improvement of her symptoms. Upon review six months later, she no longer had any abdominal pain or fever. Follow-up CT of the pancreas done at seven-month (Fig. 3a) and ten-month (Fig. 3b) intervals showed resolution of the pancreatic head mass.

DISCUSSION

Pancreatic tuberculosis (TB) is very rare.⁽¹⁾ In a study of 112 patients with abdominal tuberculosis, pancreatic involvement was seen in only three patients.⁽²⁾ Interestingly, in another review of 300 cases of abdominal TB, none of the patients had pancreatic involvement.⁽¹⁾ In a review study of 1,656 autopsies of patients with TB, pancreatic involvement was seen in only 4.7% of cases.⁽³⁾

The common clinical presentations in pancreatic TB were vague epigastric pain, weight loss and low grade fever.^(5,6) These are non-specific in themselves, but when taken together, the physician is usually alerted to the possibility of an underlying abdominal malignancy. Pancreatic cancer was the leading diagnosis in all the 17 case reports of pancreatic TB until the availability of pancreatic tissue for pathological examination.⁽⁵⁾ Early diagnosis is important to avoid unnecessary diagnostic or therapeutic procedures, as pancreatic TB is treated medically with excellent results.⁽⁵⁾

Although ESR is a non-specific marker, it has been

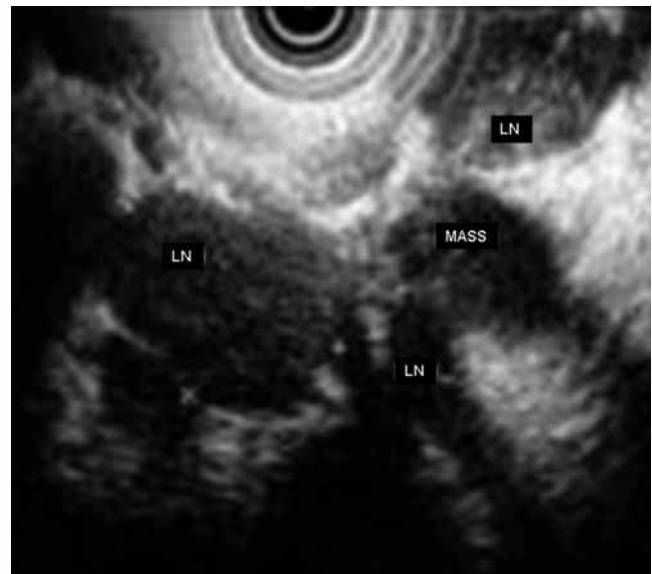


Fig. 2 Endoscopic US image shows the pancreatic mass (MASS) and the peripancreatic lymph nodes (LN).



Fig. 3 Contrast-enhanced axial CT images done after the start of antituberculous treatment show that (a) at seven months, there was significant resolution of the complex mass in the head of pancreas (arrow) and the peripancreatic lymph nodes; and (b) at ten months, findings at the head of the pancreas (arrow) were stable, with no evidence of recurrence.



Fig. 4 Axial CT image of a 70-year-old woman with pancreatic TB shows cystic masses in the head and uncinete process of the pancreas (arrows). There is also stranding of the peripancreatic fat (arrowhead). The patient presented with right iliac fossa pain, fever and an increased total white cell count. Exploratory laparotomy for perforated appendicitis was performed with a histology of non-specific chronic inflammation. She subsequently developed erythema nodosum. FNA of the peripancreatic fluid grew mycobacterium TB. The patient was successfully treated with antituberculous treatment.

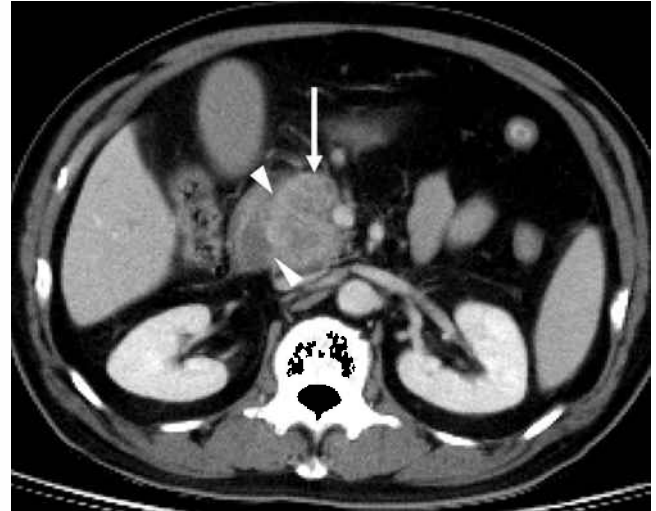


Fig. 5 Axial CT image of a 57-year-old man with a pancreatic tumour shows a heterogeneous mass (arrow) with effacement of the pancreaticoduodenal groove (arrowheads). The patient presented with a two-week history of epigastric pain, fever, loss of appetite and loss of weight, and subsequently underwent a Whipple's operation with a gastrojejunostomy performed. Histopathology was consistent with pancreatic adenocarcinoma.

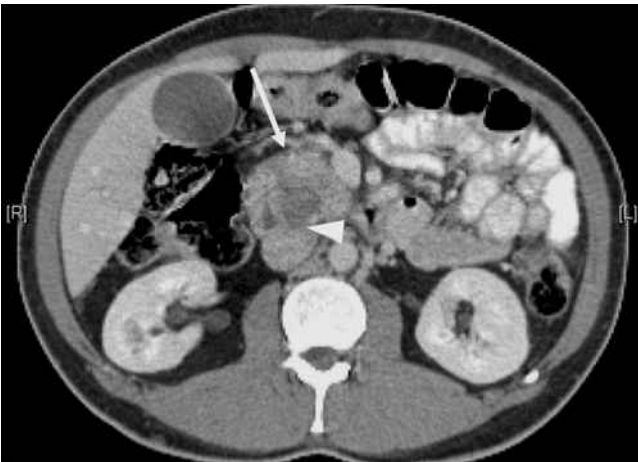


Fig. 6 Axial CT image of a 42-year-old man with pancreatic tumour shows a heterogeneous mass at the pancreatic head (arrow) with effacement of the fat plane between this mass and the posterior-sited inferior vena cava (arrowhead). The patient presented with a six-month history of chronic diarrhoea and steatorrhoea. He underwent a Whipple's operation with histology demonstrating pancreatic adenocarcinoma.

shown to be elevated in most patients with pancreatic TB.^(6,7) The tuberculin skin test is also useful in diagnosis of pancreatic TB, but it has to be pointed out that it has a false-negative rate of 10%–25%.^(7,8)

There is a variable spectrum in the CT findings of pancreatic TB in the literature, which is limited to individual case reports or small series. These CT findings

include a focal mass of low attenuation,⁽⁵⁾ a cystic mass,⁽⁹⁾ small nodular lesions,⁽¹⁰⁾ pancreatic calcification⁽¹¹⁾ and focal⁽¹²⁾ and diffuse enlargement of the pancreas.⁽¹¹⁾

The most common CT manifestation of pancreatic TB is a mass.^(11,14) The largest study of 16 patients reported that all patients demonstrated a heterogeneous, predominantly hypodense pancreatic mass⁽¹¹⁾ which was difficult to differentiate from pancreatic carcinoma. The similarity in appearances of pancreatic tuberculosis and pancreatic carcinoma are illustrated in Figs. 4–6. In pancreatic carcinoma, the hypoattenuating appearance may be because of central necrosis, or more commonly due to differential contrast enhancement by tumour tissue and normal pancreas.⁽¹³⁾ In pancreatic TB, the non-enhancing areas may represent caseated necrosis or pus.

Of interest is the fact that the majority of these pancreatic tuberculous masses occur in the head, based on review of the limited literature.^(4,5,9-11,14-16) This predisposition towards the pancreatic head is similar to that seen in adenocarcinoma of the pancreas.⁽¹³⁾ The reason for this may be because of the rich dual blood supply to the head of pancreas from branches of the gastroduodenal artery of the coeliac axis (superior, posterior and anterior pancreaticoduodenal arteries) and the pancreaticoduodenal branches (inferior, posterior and anterior) from the superior mesenteric artery.⁽¹⁷⁾ It is possible for pancreatic TB to result from haematogenous spread, although the most likely mechanism is probably by contiguous spread from adjacent peripancreatic lymph nodes.^(10,15)

EUS-FNA is now considered to be the preferred diagnostic modality for pancreatic masses, as recommended by the American Joint Commission on Cancer.⁽¹⁸⁾ EUS-FNA has helped diagnosis in cases where there was no clear cut clinical and radiological features to suggest whether a pancreatic mass is neoplastic or infective.⁽¹⁹⁾ EUS-FNA is a low-complication technique with a complication rate of 1%–2%, where the majority of complications are minor, like point bleeding, infection and pancreatitis.⁽²⁰⁾ However, it has to be pointed out that EUS-FNA is a technically-difficult procedure, with a learning curve that is considerably longer than for percutaneous FNA using CT or ultrasound guidance.^(21,22) Physicians also have to be aware that the path of the needle impacts the material obtained and predisposes result analysis towards potential diagnostic pitfalls as described below.⁽²²⁾ In EUS-FNA, the pancreatic head and uncinate process are accessed transduodenally. Uncinate lesions are especially difficult to target, because the echoendoscope is in the long position, which decreases the force and axis of tissue penetration.⁽²³⁾ The pancreatic body and tail are accessed through the stomach.⁽²²⁾ The path of pancreatic aspirates may yield fragments of normal gastrointestinal tract epithelium, which can be mistaken for a mucinous neoplasm or pancreatic epithelium, leading to false diagnoses or overestimation of specimen adequacy.^(20,22) Intraluminal mucin from the gut may also be a diagnostic pitfall as it may be interpreted as mucin from a mucinous neoplasm.⁽²²⁾

Ultrasonography has been used as a first-line imaging modality for pancreatic TB,^(11,16) with demonstration of heterogeneous pancreatic masses, calcification and diffuse pancreatic enlargement. Magnetic resonance imaging for pancreatic TB has also been performed with non-specific findings, which may be focal or diffuse in nature.^(11,24) Focal pancreatic TB has been described as a well-defined mass, usually located in the pancreatic head showing heterogeneous enhancement.^(11,24) Diffuse pancreatic TB is characterised by pancreatic enlargement and heterogeneous enhancement.⁽²⁴⁾

CT is a useful modality for the follow-up of pancreatic TB following diagnosis and anti-tuberculous treatment. In our case, follow-up CT done seven months after the initial scan showed complete resolution of the pancreatic mass. Another CT done ten months after the initial scan did not show any recurrence.

In summary, pancreatic TB is rare and can mimic pancreatic carcinoma both clinically and radiologically. Histological diagnosis is hence crucial before appropriate medical therapy can be instituted. While the non-surgical diagnosis of this entity continues to be a challenge, EUS-FNA has been shown to an excellent minimally-invasive modality. CT is useful in the follow-up of these cases for documentation of resolution.

ABSTRACT

A 76-year-old woman presented with a five-day history of fever and abdominal pain. Her urine culture grew *Candida albicans*. She was treated with intravenous antibiotics, as having a urinary tract infection, but her fever persisted. Computed tomography of the abdomen showed a cystic mass at the pancreatic head and uncinate process with peripancreatic lymph nodes. Given the patient's high operative risk and her clinical picture favouring sepsis, endoscopic ultrasonographical fine-needle aspiration (EUS-FNA) which was performed, revealed pus with acid-fast bacilli seen in the cell block material. The patient was started on antituberculous medication with rapid improvement of symptoms. Pancreatic tuberculosis (TB) is rare and can mimic pancreatic carcinoma both clinically and radiologically. Histological diagnosis is crucial before administration of appropriate therapy. The usefulness of EUS-FNA and its pitfalls, as well as the other radiological modalities for the evaluation and assessment of pancreatic TB are discussed.

Keywords: endoscopic ultrasonography, fine-needle biopsy, pancreas, spiral computed tomography, tuberculosis

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SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200707A)

- | | True | False |
|---|--------------------------|--------------------------|
| Question 1. The following describe the presentation of pancreatic tuberculosis (TB): | | |
| (a) Pancreatic involvement is commonly seen in patients with abdominal TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Epigastric pain, weight loss and fever are common clinical presentations for pancreatic TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Erythrocyte sedimentation rate (ESR) is elevated in most patients with pancreatic TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) The tuberculin skin test is not useful in the diagnosis of pancreatic TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 2. The following describe pancreatic TB pathology: | | |
| (a) Majority of pancreatic tuberculous masses occur in the uncinate process. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Calcification is the most common manifestation of pancreatic TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Both pancreatic TB and pancreatic adenocarcinoma have a predilection for the head of the pancreas. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Pancreatic TB usually results from contiguous spread from adjacent peripancreatic lymph nodes. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 3. The following describe imaging modalities used for pancreatic TB: | | |
| (a) Ultrasonography can be used as a first line imaging modality. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) It is easy to differentiate between pancreatic TB and pancreatic cancer on CT. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Pancreatic TB can present as pancreatic enlargement and heterogeneous enhancement on magnetic resonance imaging. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Endoscopic ultrasonography-guided fine needle aspiration is the preferred diagnostic modality for pancreatic masses. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 4. Endoscopic-ultrasonography and fine-needle aspiration (EUS-FNA): | | |
| (a) EUS-FNA is a low-complication technique. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) EUS-FNA is technically easier to perform than percutaneous FNA using CT or ultrasound guidance. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) Pancreatic uncinate process lesions are difficult to target. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) Aspirated fragments of normal gastrointestinal tract epithelium can be mistaken for a mucinous neoplasm or pancreatic epithelium, leading to false diagnoses. | <input type="checkbox"/> | <input type="checkbox"/> |
| Question 5. The following statements describe treatment and follow-up of pancreatic TB: | | |
| (a) Pancreatic TB shows good response to antituberculous medication of isoniazid, rifampicin and pyrazinamide. | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) Whipple's operation should be performed once a diagnosis of pancreatic TB is made. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) CT is a useful modality for the follow-up of pancreatic TB. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) EUS-FNA is an acceptable modality for the follow-up of pancreatic TB due to its low complication rate. | <input type="checkbox"/> | <input type="checkbox"/> |

Doctor's particulars:

Name in full: _____
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(1) Answers will be published in the SMJ September 2007 issue. (2) The MCR numbers of successful candidates will be posted online at www.sma.org.sg/cme/smj by 15 September 2007. (3) All online submissions will receive an automatic email acknowledgment. (4) Passing mark is 60%. No mark will be deducted for incorrect answers. (5) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.

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