
CASE REPORT

The Role of Chemical Shift Magnetic Resonance Imaging in the Diagnosis of Focal Fatty Replacement of the Pancreas

HS Fung, S Lau, KS Tse, JWC Wai, WK Wong, KW Tang, SCH Chan

Department of Radiology and Imaging, Queen Elizabeth Hospital, Kowloon, Hong Kong

ABSTRACT

Focal fatty replacement of the pancreas is a rare benign disease that has been associated with obesity, diabetes mellitus, chronic pancreatitis, hereditary pancreatitis, and obstruction of the pancreatic duct. This report of a 48-year-old woman with focal fatty replacement of the pancreas illustrates the typical imaging findings on chemical shift magnetic resonance imaging. The differential diagnosis and a review of literature are discussed.

Key Words: Magnetic resonance imaging; Pancreas

INTRODUCTION

Focal fatty replacement of the pancreas or pancreatic lipomatosis is a rare benign disease.^{1,2} The condition has been associated with obesity, diabetes mellitus, chronic pancreatitis, hereditary pancreatitis, obstruction of the pancreatic duct by calculus or tumour, and cystic fibrosis, a western disease that is rare in Hong Kong.¹⁻⁴ Focal fatty replacement of the pancreas can mimic a hypodense mass on contrast-enhanced computed tomography (CT),⁵ and an ill-defined neoplasm cannot be excluded from the differential diagnoses. Differentiating this rare benign pancreatic condition from other pancreatic tumours is essential, as the management plans and prognoses differ. Magnetic resonance imaging (MRI) is helpful for confirming the diagnosis of focal fatty replacement of the pancreas,^{3,6,7} especially chemical shift MRI.^{8,9}

This report is of a 48-year-old woman with focal fatty replacement of the pancreas detected by chemical shift MRI. To the authors' knowledge, this condition has not been reported previously in Hong Kong.

CASE REPORT

A 48-year-old woman presented in 2007 with epigastric pain for 2 months. Her past medical history was

unremarkable. Routine blood tests, including complete blood count, liver and renal function tests, and amylase were normal. Ultrasound of the abdomen showed gallstones but the pancreas was obscured. Dynamic contrast-enhanced multidetector CT of the pancreas was performed using a 64-slice scanner (Somatom Sensation Siemens Cardiac 64; Siemens Medical Solutions, Erlanger, Germany) to exclude pancreatic pathology. CT showed a low-attenuation lesion without bulging contours in the head and uncinate process of the pancreas. The low-attenuating area showed fat attenuation (-27 HU) [Figure 1]. There was no evidence of vascular encasement, ductal obstruction, or regional lymphadenopathy.

MRI with chemical shift in-phase and opposite-phase imaging was subsequently performed on a 1.5-T unit (MAGNETOM Avanto; Siemens Medical Solutions) with a phased array body coil. In-phase and opposed-phase dual echo chemical shift MRI scans were obtained in the transverse plane with a 2-dimensional spoiled gradient-echo sequence with the following parameters: echo time/repetition time, 152/5.3 and 152/2.7; section thickness, 6 to 8 mm; intersection gap, 1.6 mm; field of view, 35 cm; matrix size, 256 x 256; and flip angle, 80°. Dual-echo acquisition was used whereby both the in-phase and opposed-phase MRI scans were obtained during the same breath-hold. Transverse gradient-echo T1-weighted in-phase MRI showed no abnormality in the corresponding area in the head of the pancreas (Figure 2a). Transverse gradient-echo T1-weighted opposed-phase MRI showed signal drop in the corresponding area in the head of the pancreas, suggesting that the

Correspondence: Dr HS Fung, Department of Radiology and Imaging, Queen Elizabeth Hospital, 30 Gascoigne Road, Kowloon, Hong Kong.

Tel: (852) 2958 6242; Fax: (852) 2958 6048;

E-mail: dicksonfunghs@gmail.com

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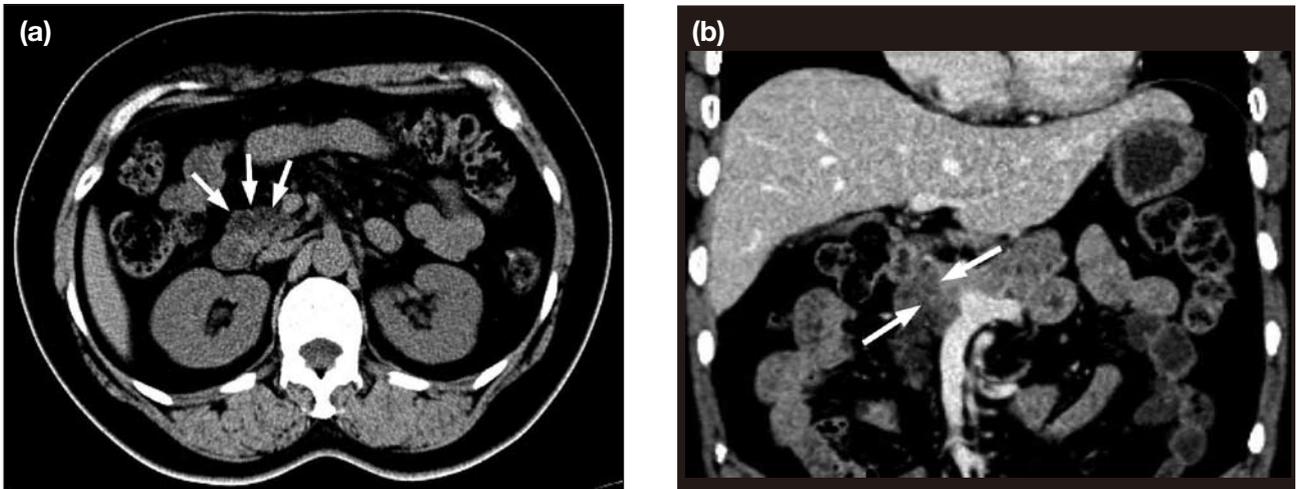


Figure 1. Computed tomography images of the pancreas. (a) Non-contrast computed tomography (axial image) showing a low-attenuation lesion without bulging contours in the head of the pancreas (arrows); and (b) contrast-enhanced computed tomography (coronal reformat images) showing a low-attenuation lesion in the head and uncinate process of the pancreas (arrows) abutting the portal and superior mesenteric vein, with no evidence of vascular encasement.

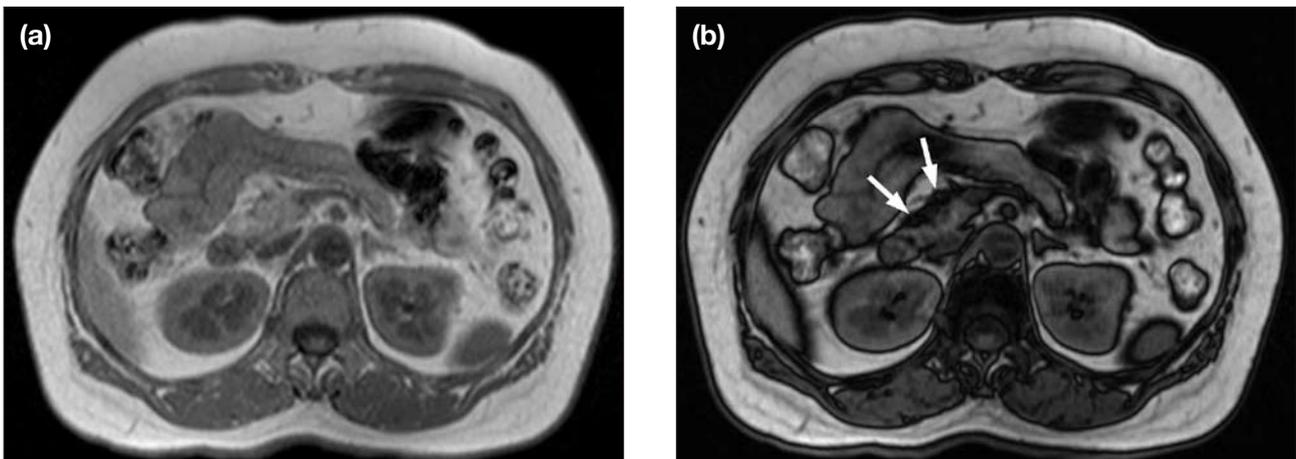


Figure 2. Chemical shift magnetic resonance images of the pancreas. (a) Transverse gradient-echo T1-weighted in-phase image showing no abnormality in the head of the pancreas; and (b) transverse gradient-echo T1-weighted opposed-phase image showing a hypointense lesion (arrows) in the head of the pancreas.

lesion was composed of microscopic fat (Figure 2b). The imaging findings were consistent with focal fatty replacement of the pancreas.

This patient had no clinical evidence of disease. The clinical and radiological findings suggested that her epigastric pain was related to gallstones. She refused further intervention and chose close clinical monitoring.

DISCUSSION

The pancreatic lipid in focal fatty replacement of the pancreas is confined to the interstitial stroma and does not involve the exocrine or endocrine parenchymal cells. This lipid is usually of little clinical significance.¹⁰ However, recognition of this entity is important for radiologists, as uneven fatty replacement of the pancreas can present as a

focal fatty mass mimicking a pancreatic cystic neoplasm or other pancreatic tumour.^{2,5} Non-contrast CT is essential for detecting the fat density using negative attenuation values. However, mild focal fatty replacement of the pancreas cannot be diagnosed with CT alone and CT is not accurate for showing microscopic lipid deposits. In addition, contrast-enhanced CT does not show a negative attenuation value, as normal pancreatic parenchyma trapped between fatty replacement areas exhibits contrast enhancement.

Chemical shift MRI is useful for confirming the diagnosis of focal fatty replacement of the pancreas.^{3,6-9} Characteristic loss of signal intensity on opposed-phase T1-weighted gradient-echo image compared with the corresponding in-phase image establishes the microscopic lipid content of the focal abnormality detected on CT.

This MRI technique excludes a diagnosis of non-fat containing causes such as pancreatic adenocarcinoma or neuroendocrine tumour. The T1-weighted in-phase sequence shows focal fatty replacement of the pancreas with a signal intensity similar to or higher than that of the remainder of the pancreas.¹¹ This finding is not found in most pancreatic malignancies, which appear as areas of low signal intensity on T1-weighted sequences. Another clue to the diagnosis is the location within the pancreas. Previous reports have shown that fatty replacement is more severe in the ventral aspect of the head of the pancreas,^{5,9} although the reason is unclear. It has been shown that the embryological ventral pancreas is composed of smaller exocrine cells and scanty or no interacinar fat, with more abundant interlobular fibrous tissue than the embryologic dorsal counterpart.⁵ Previous reports of CT and ultrasound indicate that focal fatty sparing of the pancreas was present within the dorsal aspect of the pancreatic head and uncinate process.^{7,12}

Multiphase imaging for CT and MRI is also useful for establishing the diagnosis. As for this patient, coronal reformatted images from multidetector CT clearly show the relation of the lesion to the adjacent major vasculature. The absence of vascular invasion and lack of mass effect are also clues for the diagnosis.

The differential diagnosis includes pancreatic lipoma. Pancreatic lipomas are rare and are usually incidental findings, although they may be symptomatic and produce pancreatic or biliary obstruction or both. Pancreatic lipomas are well-circumscribed masses that are composed of fat and contain a few scattered septa or vessels, but do not have identifiable pancreatic parenchyma, and are readily recognised on CT.^{2,9} As with lipomas found elsewhere in the body, conservative management is often indicated.¹³

Focal fatty replacement of the pancreas is a rare entity that can mimic a hypoattenuating mass on CT. This

patient illustrates the clinical usefulness of in-phase and opposed-phase dual echo chemical shift MRI for establishing the correct diagnosis and avoiding unnecessary invasive diagnostic procedures and surgery. Knowledge of the typical location of the ventral aspect of the pancreatic head and signal drop in opposed-phase T1-weighted MRI are useful for making the correct diagnosis of this rare but benign entity.

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