

Simultaneous Acquisition of an In-Phase and Out-Phase (SINOP) Sequence with Automatic Subtraction for Fatty Infiltration of the Pancreas

Shinji KOIKE¹, Katsuyoshi ITO², masayasu YASUI³, ayame SHIMIZU³, Nobuhiko OGASAWARA⁴, Keiko KISHIMOTO⁵, munemasa OKADA³, kazuyoshi SUGA³, naofumi MATSUNAGA³

¹Yamaguchi Univ. School of Medicine, Department of Radiology, Ube, Japan; ²Yamaguchi University School of Medicine, 1-1-1 Minami-kogushi, Ube, Yamaguchi Japan; ³; ⁴Radiology Department, Ube, Japan; ⁵Yamaguchi University School of Medicine, 1-1-1, Minamikogushi, Ube, Yamaguchi Japan;

Introduction

The findings of focal fatty infiltration and focal fatty sparing of the pancreas have been described in both sonography and CT literature. Focal fatty infiltration can mimic a hypoattenuating mass on contrast-enhanced CT examinations and fatty sparing of the pancreatic head can appear as pseudotumor. Recently, effectiveness of MRI was reported with chemical shift imaging technique, which shows focal fatty infiltration as high signal intensity at in-phase T1-weighted image in comparison with the surrounding normal pancreatic parenchyma. In this technique, two separate measurements have been required to obtain the two images which is associated with several disadvantages such as misregistration OP and IP images, and additional time required for acquisition of the two different images or the calculation of subtraction images (IP-OP) for assisting in the identification of fat. Taupitz et al. first described the implementation of a new sequence that allowed the simultaneous acquisition of an IP and OP image (SINOP) in the multislice mode during breath-hold on standard MR imager without prolongation of the examination time. We modified the SINOP sequence, the TEs of which were optimized minimally for OP and IP images and that subtraction images (IP-OP) as fat images were taken automatically immediately after acquisition of IP and OP images. In this study, we evaluated usefulness of this modified sequence to detect fat infiltration of the pancreas.

Methods

A T1-weight double-echo SINOP sequence on the basis of a FLASH sequence was implemented on a 1.5 T whole body scanner (Manotom Vision, Siemens): TR=150 msec, TE=2.3 (OP) and 4.7 (IP) msec (original SINOP sequence, TE=2.8 msec for OP, and 5.3 msec for IP), bandwidth=650 Hz/pixel, flip angle=70, matrix 120X256 at a 5/8 rectangular FOV, 16 sections, section thickness=8 mm, 20 sec acquisition time. Immediately after acquisition of the OP and IP images, subtraction images (IP-OP) were automatically calculated. Therefore, a total of 48 images (16 section \times 3 sets) was obtained on this sequence in each patients. MR imaging was performed with a phased-array body coil and during a single breath-hold in all cases. Our study group consisted of 186 patients (101 male and 85 female patients, age range 34-78 years, mean age 52), who underwent routine abdominal MR study including SINOP sequence. The cases with pancreatic disease were excluded in our study. Presence of fatty infiltration was evaluated with IP, OP, and subtraction images. When the fatty infiltration of the pancreas was visible, the type of fatty infiltration was classified into two categories: diffuse or nodular type.

Results

Fatty infiltration was seen in the pancreatic head in 80 of 186 cases (43 %), in the pancreatic body in 38 of 186 cases (20 %), and in the pancreatic tail in 36 of 186 cases (19 %). In pancreatic head, diffuse type was seen in 17 cases (43 %) and nodular type in 23 cases (57 %). In pancreatic body, diffuse type was seen in four cases (21 %) and nodular type in 15 cases (79 %). In pancreatic tail, diffuse type was seen in two cases (11 %) and type nodular type 16 cases (89 %).

All cases of diffuse type were identified by signal loss on OP images in comparison with IP images.

13 % of nodular type were identified by signal loss on OP images in comparison with IP images, however, 100 % of nodular type were identified with subtraction images (IP-OP). Therefore, all cases of fatty infiltration were exactly identified with subtraction images (IP-OP).

Discussion

Fatty infiltration of the pancreas occurs most frequently in the elderly and obese population, although the etiology of this entity is uncertain. In focal fatty infiltration, contrast-enhanced CT reveals low-attenuating tissue interposed between normal pancreatic parenchyma. A hypoattenuating lesion in the pancreas on a contrast-enhanced CT

scan is a nonspecific finding, furthermore neoplasm often cannot be excluded.

The area of fatty infiltration of the pancreas appeared to be relatively hyperintense on the subtraction image (IP-OP). Thus, the fatty infiltration of the pancreas was easily and reliably identified with this technique. On subtraction image (IP-OP), the tissues having large amount of fat such as subcutaneous fat tissue may not show hyperintense. However, it is not problematic to identify the fat deposit of the pancreas by the subtraction images (IP-OP), because the amount