

NON-INVASIVE INVESTIGATION OF EXOCRINE PANCREATIC FUNCTION USING CINE DYNAMIC MRCP WITH A SPATIALLY SELECTIVE INVERSION-RECOVERY (IR) PULSE

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Target audience: Radiologist, physician.

Purpose: Recent study showed that the secretory flow of the pancreatic juice can be directly and noninvasively visualized as a high-signal-intensity inflow within the tagged area at frequent intervals in normal subjects by means of non-pharmacological, cine dynamic MRCP with a spatially selective inversion recovery (IR) pulse. The purpose of this study was to investigate whether this technique can be used for evaluation of exocrine pancreatic functions in patients with chronic pancreatitis in comparison with currently available pancreatic exocrine function test with synthetic peptide.

Materials and Methods: This study included 10 patients with suspected chronic pancreatitis (mean age, 59.7 years; range, 31–76 years) who underwent both cine dynamic MRCP with a spatially selective IR pulse and exocrine pancreatic function tests. Firstly, a breath-hold two-dimensional (2D) thick-slab MRCP image was obtained to demonstrate the overview of the pancreaticobiliary system, and was used as a reference image for the placement of a spatially selective IR pulse (Fig.1a). Imaging parameters were as follows; TR/TE=4000/500msec, slice thickness=50mm, matrix=320x320, FOV=32x32cm. Then, a spatially selective IR pulse (inversion time=2200msec) with 20mm width was placed on the pancreas head perpendicular to the main pancreatic duct to null the static pancreatic juice signal using the same MRCP sequence (Fig.1b). Pancreatic juice flowing into the area of a spatially selective IR pulse (area between the white line in Fig.1c) demonstrated high signal intensity. Cine dynamic images were successively taken 20 times using this method. Images were evaluated for (1) the frequency that the pancreatic juice flowed in the pancreatic duct and (2) the distance that the pancreatic juice moved in the pancreatic duct within the area of a selective IR pulse using a following 5-point grading scale (grade 0 = no flow, grade 1 = <6 mm, grade 2 = 6–10 mm, grade 3 = 11–15 mm, grade 4 = >15 mm). On exocrine pancreatic function tests, subjects were administered N-benzoyl-L-tyrosyl-p-aminobenzoic acid (BT-PABA) reagent, and the urinary PABA excretion rate (%) was calculated from 6-hr urine collection. The frequency of pancreatic juice inflow and the mean inflow grade were each compared with the urinary PABA excretion rate (%).

Results: The pancreatic juice inflow was observed 0–20 times (median, 12 times; mean, 10.5 times; range, 0–20 times) in a series of 20 images in patients with suspected chronic pancreatitis. The mean secretion grade (the distance that the pancreatic juice moved in the pancreatic duct) was 1.35 (range, 0–3.25). In the comparison with exocrine pancreatic function tests, the urinary PABA excretion rate (%) had significant positive correlations with both the mean secretion grade ($r = 0.68$, $P < 0.05$) and frequency of inflow ($r = 0.66$, $P < 0.05$) (Fig.2).

Conclusion: Cine dynamic MRCP with a spatially selective IR pulse has a potential to evaluate pancreatic exocrine function noninvasively in patients with suspected chronic pancreatitis.

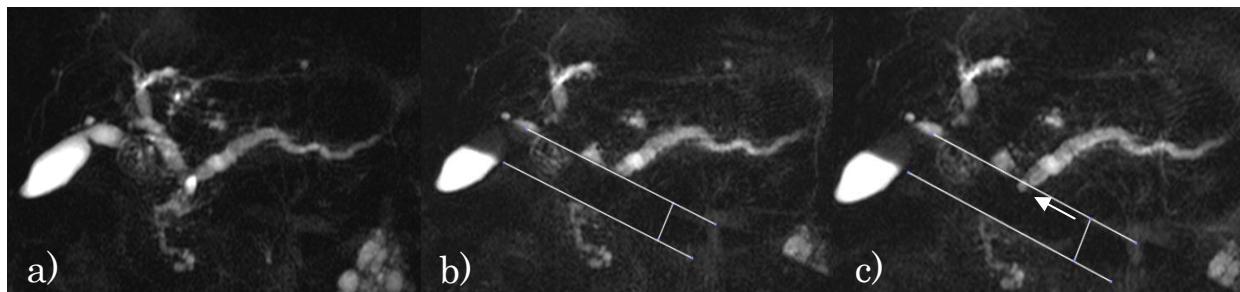


Figure 1. a)–c): Cine dynamic MRCP with a spatially selective IR pulse in a patient with suspected chronic pancreatitis. a) A breath-hold 2D thick-slab MRCP image obtained as a reference image demonstrated the overview of the pancreaticobiliary system. b) On MRCP image obtained with a spatially selective IR pulse, the signal intensity of the static pancreatic juice in the area between the parallel white lines was nulled and the pancreatic duct in that area was shown as area of low signal intensity. c) The secretory inflow of the pancreatic juice was clearly observed as area of high signal intensity (arrow) within the area of a selective IR pulse.

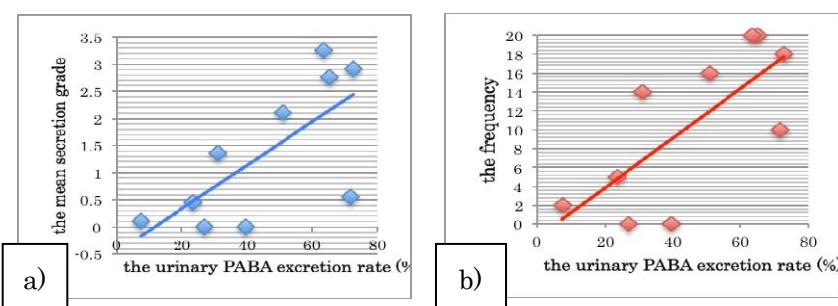


Figure 2. a) The urinary PABA excretion rate (%) had significant positive correlations with the mean secretion grade ($r = 0.68$, $P < 0.05$). b) The urinary PABA excretion rate (%) had significant positive correlations with the frequency of inflow ($r = 0.66$, $P < 0.05$).