ALTERATION IN SECRETORY FLOW OF PANCREATIC JUICE IN PATIENTS WITH INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS OF THE PANCREAS: EVALUATION BY MEANS OF SERIAL MRCP WITH SPATIALLY LABELED INVERSION RECOVERY PULSE

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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 by means of nonpharmacological, cine dynamic MRCP with a spatially selective inversion recovery (IR) pulse, and suggested that this technique may have the potential to evaluate impaired pancreatic exocrine functions in patients with pancreatic diseases. However, in the clinical practice, we have sometimes encountered patients with intraductal papillary mucinous neoplasms (IPMNs) of the pancreas without evidence of pancreatitis who had diminished secretory flow of pancreatic juice detected by cine dynamic MRCP with spatially labeled IR pulse. The purpose of this study was to non-invasively evaluate the alteration in the secretory flow of pancreatic juice in patients with IPMNs of the pancreas by using cine dynamic MRCP with spatially labeled IR pulse in comparison with the physiological flow of pancreatic juice in normal subjects.

Materials and Methods: Sixteen patients with IPMNs of the pancreas without evidence of pancreatitis and 17 subjects without a history of pancreatic diseases were included. At first, breath-hold, thick-slab 2D MRCP image was obtained to depict the main pancreatic duct in the oblique-coronal plane as a reference image. Imaging parameters were as follows; TR/TE=4000/500msec, slice thickness=50mm, matrix=320x320, FOV=32x32cm. Then, a spatially selective inversion recovery 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. Imaging time was 4 seconds. In this method, inflow of the pancreatic juice is expected to be observed as high signal within the tagged area when the pancreatic juice runs through the main pancreatic duct. Cine dynamic MRCP with a spatially selective IR pulse were repeatedly performed every 15 seconds during 10 minutes (a total of 40 series). Cine dynamic MRCP images were evaluated for 1) the visibility of the inflow high signal of the pancreatic juice, 2) the frequency that the pancreatic juice flowed (inflow high signal), and 3) the distance that the pancreatic juice flowed within the tagged area (grade1 = less than 5mm, grade2 = 5-10mm, grade3 = 11-15mm, grade4 = more than 15mm). Then, these findings were compared between patients with IPMNs and subjects without pancreatic diseases.

Results: The pancreatic juice inflow was observed in all 33 subjects. Regarding the frequency of the pancreatic juice inflow, it was observed 1-37 times (average: 12.5±10.9 times) in 40 series in patients with IPMNs while it was seen 22-40 times (average: 31.2±4.9 times) in 40 series in normal subjects, suggesting that the pancreatic juice has less frequently flowed in patients with IPMNs than in normal subjects ($P < 0.001$). The distance that the pancreatic juice flowed was significantly shorter in patients with IPMNs (averaged grade=0.62±0.56) than that in normal subjects (averaged grade=2.39±0.66) ($P < 0.001$).

Conclusion: The flow of the pancreatic juice can be visualized non-invasively by means of cine dynamic MRCP with spatially labeled IR pulse. The flow of the pancreatic juice was impaired or became slow in patients with IPMNs, probably due to mixture of mucinous component from IPMNs in the pancreatic duct. It would be important to be aware of the alteration in the secretory flow of the pancreatic juice in patients with IPMNs even though pancreatic exocrine function is normal.

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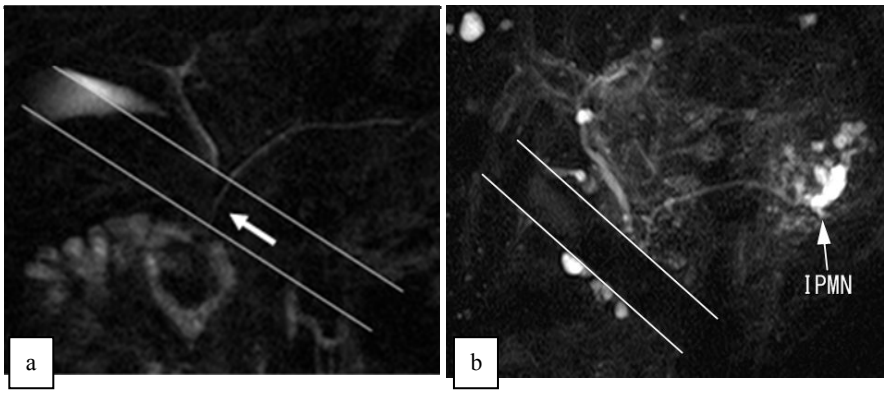

a) MRCP with a spatially selective IR pulse in a normal subject. The secretory inflow of the pancreatic juice was observed as high signal (arrow) within the tagged area (between white lines).
b) MRCP with a spatially selective IR pulse in a patient with IPMN of the pancreas. The secretory inflow of the pancreatic juice was not observed within the tagged area. (Static pancreatic juice signal in the tagged area was nulled and the pancreatic duct in this area was shown as low signal intensity.)