

# POSTPRANDIAL CHANGES OF SECRETORY FLOW OF PANCREATIC JUICE IN THE MAIN PANCREATIC DUCT: EVALUATION WITH CINE DYNAMIC MRCP AND 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 evaluate the influence of oral ingestion in secretory flow dynamics of physiological pancreatic juice within the main pancreatic duct in healthy volunteers by using cine dynamic MRCP and a spatially selective IR pulse non-invasively.

**Materials and Methods:** A total of 38 healthy volunteers (11 men, 27 women; mean age, 43.6 years  $\pm$  16.0; age range, 21-76 years) who had no history of pancreatic diseases were included. 1.5-T clinical MR imaging system (EXCELART Vantage powered by Atlas, Toshiba Medical Systems, Tochigi, Japan) with quadrature-detection phased-array coils (16 channels with 32 elements) was used. MRCP using spatially selective IR pulse was performed every 15 seconds (4 seconds scan and 11 seconds rest and breathing) during 5 minutes (a total of 20 images) as a cine-dynamic fashion. IR pulse with 20mm width was placed on the pancreatic head to evaluate the movement (in-flow) of pancreatic juice (Fig.1). A set of 20 MRCP images was repeatedly obtained before and after liquid oral ingestion at every 7 minutes (including 2 minutes interval) for 40 minutes (a total of seven sets). Liquid ingestion (Terumeal 2.0 $\alpha$  ; 14.5g protein, 52.0g carbohydrate, and 15.0g fat in 400 Kcal/200 ml. Terumo, Tokyo, Japan) was carried out while the supine position on the inspection table. Images in each set were evaluated for the distance that the pancreatic juice moved in the pancreatic duct within the area of a spatially selective IR pulse using a following 5-point secretion grading scale (grade0, no secretion; grade1,  $\leq$ 5 mm; grade2, 6–10 mm; grade3, 11–15 mm; grade4, >15 mm). Secretion grade of pancreatic juice based on moving distances was compared before and after oral ingestion.

**Results:** The median secretion grade of pancreatic juice was 1.6 before oral ingestion while it was 2.1 at 5 and 12 minutes, 2.2 at 19 minutes, 1.9 at 26 minutes, 1.4 at 33 minutes, and 1.2 at 40 minutes after liquid meal ingestion (Fig.2). The median secretion grade of pancreatic juice at 5-19 minutes after ingestion was significantly higher than that before ingestion ( $P<0.01$ ). Secretion grade of pancreatic juice showed a maximum peak of 2.2 at 19 minutes after ingestion. Then, the secretion grade of pancreatic juice began to gradually decline with a statistical differences at 26 minutes, 33 minutes, and 40 minutes after ingestion ( $P<0.031$ ,  $P<0.047$ ,  $P<0.02$ , respectively), compared with that at 19 minutes with maximum peak value.

**Conclusion:** Non-invasive cine-dynamic MRCP using spatially selective IR pulse showed potential for evaluating postprandial changes of secretory flow dynamics of pancreatic juice as a physiological reaction.

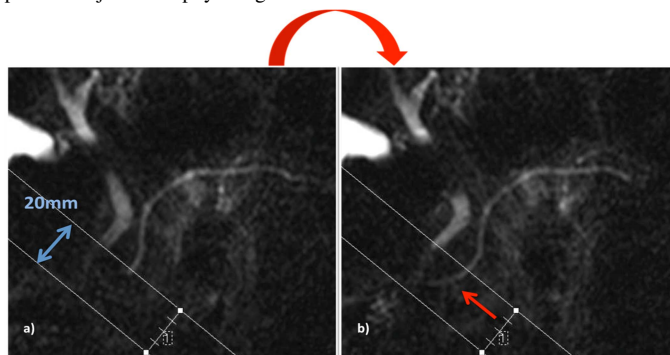


Fig.1

Figure 1. a-b) Cine dynamic MRCP with a spatially selective IR pulse in healthy volunteers. With 20mm width was placed on the pancreatic head to evaluate the movement (in-flow) of pancreatic juice.

- 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.
- 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.

Secretion grade

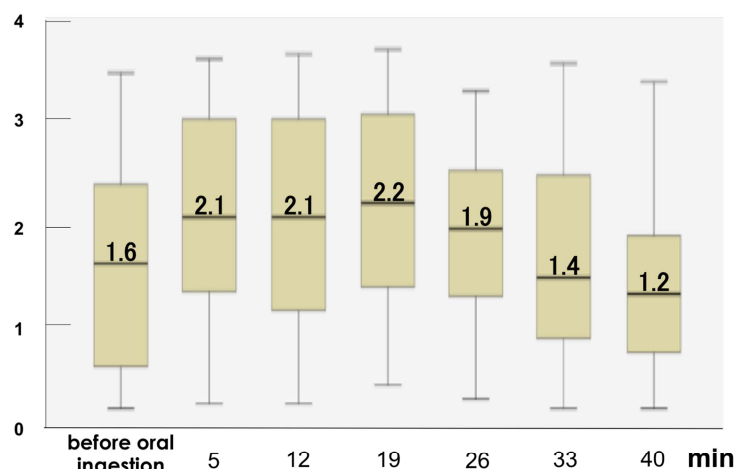


Fig. 2