Quantification of the stimulation effect on the exocrine pancreas of two doses of secretin using MRCP

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Background: Secretin is a gastrointestinal peptide hormone that stimulates acinar and ductal epithelial pancreatic cells to produce bicarbonates-rich fluid. Tests exploiting this physiologic phenomenon have been developed in the attempt to detect pancreatic exocrine dysfunctions. The most reliable tests to quantify pancreatic exocrine function are performed using invasive endoscopic techniques, such as the secretin test and the intraductal secretin test. Magnetic Resonance Cholangio-Pancreatography (MRCP) is a non-invasive diagnostic technique, now used in routine, able to evaluate pancreatic duct morphology. We propose a quantitative method using MRCP to assess pancreatic exocrine function by quantifying pancreatic fluid output and total excreted volume during exogenous secretin stimulation.

Purpose: To evaluate the stimulating effect of two different doses of secretin 1 and 0.3 clinical unit (CU) by quantifying pancreatic exocrine flow output and total excreted volume using secretin-enhanced MRCP (S-MRCP).

Material and Method: S-MRCP was performed after a fasting period of at least six hours in 10 healthy volunteers (5 male, 5 female, age range 22-29 years, mean age ± standard deviation, 24.9 yrs ± 2.3). Each examination was repeated two times in each volunteer at one week of interval for each dose of secretin (1 or 0.3 clinical unit per Kg of body weight, Secrelux®, Sanochemia, Neuss, Germany). MR protocol consisted in: 1) axial T2-weighted single-shot turbo spin-echo, respiratory triggered, covering the upper abdominal region; 2) S-MRCP, coronal multislice turbo spin-echo, heavily T2-weighted, with fat-suppression. The acquisition time for each dynamic was 12.5 sec within a single breath-hold. After the first dynamic acquisition, 20 mg of an antiperistaltic drug (Hyoscin butylbromide, Boehringer Ingelheim, Germany) was injected intravenously followed by the bolus of secretin. Thirty dynamic acquisitions were repeated at intervals of 30 seconds for 15 minutes. The quantification method was based on a individual calibration procedure providing a linear relationship between MR signal intensity and volume of the gastro-intestinal fluid. For this purpose, six additional acquisitions were performed in the same scan after ingestion of 120 mL of water in 6 increments of 20 mL. Pancreatic flow output and total excreted volume were derived from a linear regression between MR calculated volumes and time.

Results: For all examinations a linear increase of pancreatic exocrine fluid volume was found (Fig. 1). Table 1 shows mean values for pancreatic flow output and total excreted volume obtained for the two doses. The mean intra-individual absolute difference for pancreatic flow output between sessions was 0.8mL/min and 1.3 mL/min for the 1 and 0.3 CU respectively. A statistically significant difference was found between the two doses for the pancreatic flow output (P=0.03) and total excreted volume (P=0.002).

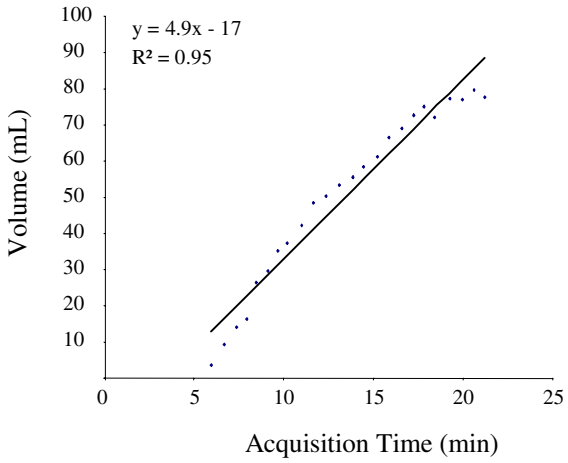

Figure 1. Linear increase of pancreatic fluid volume after secretin administration (0.3 CU). Pancreatic fluid volumes calculated for each dynamic acquisition after secretin administration were plotted against time.

TABLE 1

Mean Pancreatic Flow Output and Total Excreted Volume for the two doses of secretin

Dose	PFO (mean ± SD)	TEV (mean ± SD)
1 CU	6.6 ± 1.2	106 ± 27
0.3 CU	5.8 ± 1.6	78 ± 15

Conclusion: S-MRCP allows non-invasive quantification of pancreatic exocrine function. Pancreatic exocrine function reacts proportionally to the degree of stimulation.