Secretin Enhanced Imaging of the Pancreas

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- Consultant, Repligen Corporation
- Member, Radiology Medical Advisory Network, Philips
Acknowledgment

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Traditional Gold Standard for visualizing pancreatic and biliary ducts

500,000 cases /year for diagnosis & therapy

Issues

- Technically difficult
- Cost: >$2,000 + cost of complications
- Safety
  - Radiation exposure & sedation
  - Morbidity: ~10% = 50,000/yr
  - Mortality: ~0.5% = 2,500 deaths/yr
- NIH Consensus Statement (2002): ERCP NOT for diagnostic purposes
- Litigation
MRCP

- MRCP almost completely replaced ERCP for imaging diagnosis of the pancreatic duct
- Pancreatic duct diameter challenges the resolution of MRCP
- Benefit from increased pancreatic secretion
Secretin

- Hormone produced by duodenal epithelial cells under the stimulus of gastric acid
- Produces secretion of fluid and bicarbonate by the exocrine pancreas
- Increases the tone of the sphincter of Oddi

Secretin - Historical Perspective

- 1902: GI tract extract stimulates pancreas secretions; Secretin: first hormone discovered (Starling)
- 1940: Use in pancreatic exocrine function testing
- 1981: Extracted porcine secretin approved in US
- 2002: Synthetic porcine secretin approved US (SecreFlo)
- 2004: Synthetic human secretin approved US (Chirostim)
- 1979: Specific binding in brain (Taylor)
- 1998: Potential use in CNS disorders (Horvath)
Secretin – Safety

- No deaths or drug-related SAEs
- No anti-secretin antibody formation (allergic reactions unusual)

Most common side effects:
- Transient increase in heart rate
- Flushing
- Transient, mild abdominal discomfort
Secretin – MRCP (S-MRCP)

Secretin increases release of pancreatic juice into ducts.
Secretin acts as a natural imaging agent during MRCP.

Pre-secretin

- Narrow pancreatic duct
- Intestine

Post-secretin

- Wider pancreatic duct
- Intestine

Liver
Gall Bladder
Pancreas
Intestine
S-MRCP: Literature Review

• S-MRCP well documented (off label)
  • Over 100 articles; 40+ safety; 20+ efficacy analyses

• Safety meta-analysis
  • Extent of exposure: 1,320 patients / 1,468 exposures
  • AE’s: only 9 reported, none serious (transient, mild)

• Efficacy meta-analysis
  • Duct segments, accessory and branch ducts
    (p<0.001; 11 studies, 874 patients)
  • Duct diameters (p<0.001; 9 studies, 756 patients)
  • Image quality (p=0.01; 6 studies, 572 patients)
  • Diagnostic sensitivity (94% vs 53%)

http://www.smrcp.com/
S-MRCP: Patient Preparation

- Fasting
  - Minimum 6hrs
  - Avoid gastric contents overlapping PD
- Negative oral contrast agents
  - Gastromark [Ferumoxil]
  - Pineapple juice
  - Suppress high signal of gastric contents
- Patient education and cooperation, key

S-MRCP: Technique

- **MR pancreatography – pre-secretin (20 min):**
  - Breath-hold HASTE/SSFSE localizer + MIP
    - Axial & coronal [3-5 mm] T2-weighted images
  - Thick slab breath-hold RARE
    - Oblique coronal T2-slab, entire PD selected
  - Navigator controlled 3D images

- **Secretin MRCP (S-MRP)**
  - Post IV administration of Secretin (0.2 mg/kg body weight)
  - Dynamic imaging for 15 min (15-30 secs)
  - Test dose (?)


S-MRCP: Technique

Technique of T2 TSE Coronal slabs

- Imaging plane- Coronal
- Breath hold
- Slab thickness – 20-50mm
- No of signals acquired – 1
- FOV- 250mm(Rectangular)
- Acquisition matrix- 256
- Flip angle – 150 degrees
- TR - 2800
- Echo time - 1100

S-MRCP: Interpretation

- Pre-secretin MRCP:
  - Ductal morphology
- Post-secretin MRCP:
  - Ductal morphology and distension
  - Characterization of filling defects
  - Duodenal distension, index of function
S-MRCP: Clinical Applications

- Congenital anomalies:
  - Pancreas Divisum
  - Annular Pancreas
  - Ductal anatomical variations

- Acute Pancreatitis:
  - Ductal stricture, causing recurrent pancreatitis
  - Ductal involvement in pancreatic necrosis
  - Communicating vs noncommunicating pseudocysts
  - Planning interventional ERCP

- Chronic Pancreatitis:
  - Staging, severity chronic
  - Number, length of strictures for possible intervention
  - Focal pancreatic mass evaluation
  - Assessment of exocrine function
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S-MRCP: Clinical Applications

• Pancreatic focal lesions:
  • Differentiating side branch dilatation from cystic neoplasm
  • Differentiating side branch IPMT from nonductal cystic neoplasm
  • Differentiating pancreatic adenocarcinoma from chronic pancreatitis
  • Possible better delineation
S-MRCP: Clinical Applications

- Post surgical follow up:
  - Post sphincterectomy
  - Post stent placement
  - Post Whipple pancreatectomy
Pancreatic MRI - Functional Imaging

- **Parameters**
  - Exocrine function
  - Sphincter of Oddi function
  - Pancreatic Fibrosis

- **Methodology**
  - Dynamic S-MRCP
  - Diffusion-weighted MR (DW-MR)
  - MR spectroscopy (MRS)
Functional Imaging: Diffusion-weighted Secretin MR as a Proxy for Fibrosis

S-MRCP: Summary

- Detailed evaluation of the pancreatic ductal morphology
- Pancreatic exocrine function (functional pancreatic MRI)
- Patient education & cooperation, key to good images
- Radiologist supervision mandatory
Summary:

- Including secretin augmented MRCP in selected cases of pancreatic MR imaging provides more detailed evaluation of the pancreatic ductal morphology and also of pancreatic exocrine function.
- Patient education & cooperation is the key to good images.
- Radiologist supervision is mandatory.