

EDITORIAL

Exocrine Pancreatic Function: Evaluation with MR Imaging Before and After Secretin Stimulation

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Secretin-stimulated magnetic resonance cholangiopancreatography (SS-MRCP) enhances standard pancreatic imaging in chronic pancreatitis. Diffusion-weighted MRI added to SS-MRCP allows a qualitative and potentially quantitative estimate of pancreatic exocrine secretion, providing an alternative to standard "tube" tests.

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Despite a body of evidence that dynamic testing of exocrine pancreatic function is more sensitive than most gastroenterologists believe (1), cross-sectional and direct imaging of the pancreas have become the preferred ways to diagnose chronic pancreatitis (CP). However, with the observation that random fecal elastase-1 may replace 72 h fecal fat collection as a way to diagnose pancreatic insufficiency (2), there has been renewed interest in ways to study pancreatic exocrine function. Stevens *et al.* (3) recently demonstrated that duodenal fluid collected endoscopically after secretin stimulation showed the same anion-cation secretory curve that is found during standard "tube tests." Patients will appreciate not having a tube through the nose. However, these collections require endoscopy lasting at least 1 h, a significant burden on the patient, the endoscopist, and the support staff. Dynamic testing of pancreatic secretion needs to become more user-friendly! Secretin-stimulated magnetic resonance cholangiopancreatography (SS-MRCP) may offer the answer.

Increasingly, MRCP is the imaging modality of choice in the workup of patients suspected of having chronic pancreatitis. While both computed tomography and MRI offer three-dimensional data sets with exquisite spatial and temporal resolution, MRI has the unique ability to depict the biliary and pancreatic ducts noninvasively, in a manner similar to endoscopic retrograde cholangiopancreatography (ERCP). MRCP was first described in 1991, by Wallner *et al.* (4); it has subsequently become a routine imaging test. While the original "acquisition time" of MR sequences was more than 5 min, technical progress over the intervening years now allows MRCP images to be acquired during single breathholds. Single MRCP images can now be obtained in less than 2 s. This allows the use of MRCP in even severely compromised patients.

In 1994, Takehara *et al.* (5) reported the first comparison of MRCP and ERCP findings in 39 patients with CP. They found agreement between MRCP and ERCP data in 83–92% of cases of pancreatic ductal dilatation, 70–92% of cases of

ductal narrowing, and 92–100% of cases with filling defects. Unfortunately, MRCP showed a tendency to overestimate the degree of pancreatic ductal stenosis. In the following year, the same research group introduced the concept of SS-MRCP to overcome this limitation, reporting optimistic results in 54 patients suspected of having pancreatic disease (6). IV injection of synthetic secretin, a gut hormone, causes a rapid outpouring of bicarbonate-rich fluid from the exocrine pancreas. SS-MRCP provides significantly improved visualization not only of the main PD, but also of its side branches, when compared to nonstimulated imaging. Matos *et al.* later advanced beyond solely morphologic examination of the pancreas to study exocrine pancreatic function during SS-MRCP (7). His research group obtained dynamic MR pancreatograms before—and every 30 s over 10 min after—secretin administration in 10 normal volunteers and 13 patients suspected of having pancreatic disease. The volume of fluid filling the duodenum over time after secretin-stimulated secretion of pancreatic fluid was graded semiquantitatively. The results were compared with those of ERCP and secretin stimulation testing, with collection of pancreatic fluid. By showing that the mean "duodenal filling score" was significantly lower in patients with reduced exocrine function when compared to the volunteer group, Matos *et al.* (7) showed for the first time that SS-MRCP could potentially assess the pancreatic exocrine reserve as well as identify morphologic changes affecting the PD. Matos' results have been confirmed by other research groups (8–11). In a few specialist centers, SS-MRCP has become an accepted noninvasive way to look at pancreatic exocrine function.

In the current issue of the *Journal*, Ertuck *et al.* (12) present a different approach to noninvasive assessment of pancreatic exocrine reserve using MRI. This approach is based on "diffusion-weighted" MRI (DW-MRI), a technique already established in neuroradiology, where it is especially helpful in the assessment of early stroke and certain infectious diseases. DW-MRI is fast (<20 s), and can be performed on all modern high-field MR systems. DW-weighted MRI can be quantified

by calculating the apparent diffusion coefficient (ADC). It also detects "intravoxel incoherent motion," which includes both capillary perfusion and molecular diffusion. Ertuck *et al.* (12) report that patients without risk factors for pancreatic disease and (presumably) normal exocrine pancreatic function demonstrate an early peak of the ADC value, within 4 min after secretin stimulation, whereas patients with substantial alcohol consumption show a delayed peak. Patients with chronic pancreatitis, on the other hand, show no peak of the ADC value at all. Using 4 min as the cutoff value, Ertuck *et al.* achieved a sensitivity of 100% and specificity of 94.7% in discriminating the control group from the combined risk and chronic pancreatitis groups.

Ertuck *et al.* (12) describe a very innovative and promising technique which may help to detect patients with early chronic pancreatitis or those at risk of developing chronic pancreatitis. The beauty of this approach is that it can easily be combined with the semiquantitative method introduced by Matos *et al.* (7), which already is well established in clinical practice. It will be interesting to see whether the initial promising results from Ertuck and his colleagues can be confirmed by other research groups, and whether this innovative approach will ultimately translate into a useful tool in clinical practice.

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