

Editorial

Novel Application of Magnetic Resonance Flow Evaluation: Direct Visualization of Pancreatic Juice Movement and Its Clinical Impact

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EDITORIAL

Researchers have explored the feasibility of studying pancreatic juice movement to aid in pathological evaluations of pancreato-biliary diseases. However, assessment of pancreatic juice movement is difficult. The early measurement approach of pancreatic juice movement was direct measurement of pancreatic juice involved insertion of a tube into the main pancreatic duct. However, since this method is invasive and time-consuming, it is no longer used. A more common method to assess pancreatic juice movement is by magnetic resonance cholangiopancreatography (MRCP), which involves intravenous injection of secretin [1]. This method aids in the assessment of pancreatic juice movement by determining the change in the pancreatic or bile duct caliber before and after secretin injection; however, this method fails to demonstrate direct pancreatic juice movement. Therefore, the validity of this method for measurement of pancreatic juice movement is still controversial.

Recently, a new MR-based method has been developed for direct visualization of pancreatic juice flow, based on a time-Spatial Labeling Inversion Pulse (SLIP) technique [2]. Initially, this technique allowed examination of blood flow by selectively saturating the spins of the blood in vessels to a region of interest. After applying a nonselective inversion recovery pulse to nullify background signals, a selective labeling pulse is applied to observe the flow motion. The pancreas is imaged by this technique so that pancreatic juice flow become to visualize. This method enables various clinical applications into pancreato-biliary disease.

One clinical application is the evaluation of chronic pancreatitis, which is an inflammatory change in the pancreas followed by fibrosis leading to the gradual destruction of the pancreatic parenchyma and morphological changes such as dilatation of the duct system. Progression of chronic pancreatitis leads to decrease in exocrine pancreatic function. Thus, assessment of exocrine pancreatic function is important for chronic pancreatitis evaluation. Traditional methods such as direct measurement of

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pancreatic fluid and bicarbonate output used for assessment of exocrine pancreatic function are invasive and performed rarely. Therefore, morphological changes observed in the pancreas by imaging modalities are used to diagnose chronic pancreatitis. The new developed technique using MRI may enable assessment of exocrine pancreatic function by direct visualization of pancreatic juice flow. Researchers have revealed that the mean visualization rates of pancreatic juice tended to decrease with increase in pancreatitis severity [3].

This new technique can also be used for evaluation of pancreaticobiliary reflux (flow of pancreatic juice into the biliary tract). Since many studies have demonstrated a relation between biliary malignancies and pancreaticobiliary reflux, the evaluation of pancreaticobiliary reflux is important [4]. Pancreaticobiliary reflux usually occurs in patients with pancreaticobiliary maljunction (i.e., abnormal arrangement of the pancreaticobiliary ductal system: AAPB). AAPB is a congenital anomaly defined as a junction of the pancreatic and bile ducts located outside the duodenal wall. Since contraction of the Oddi muscle within the duodenal wall does not functionally affect the junction in patients with AAPB, continuous pancreatobiliary reflux occurs, thereby resulting in high incidence of biliary cancer. Recently, several studies have been published on the reflux of pancreatic juice into the bile duct without morphological AAPB, and the correlation of such cases with biliary diseases, especially biliary malignancies, is drawing considerable attention [5]. However, morphological changes observed on the existing imaging modalities could not be used for diagnosis of these cases. The new technique aids in the visualization of pancreatic juice flow reflux into the bile duct in patients without AAPB, which may enable determination of a relationship between the reflux and biliary cancer [2,6]. Thus, the new technique may help ascertain what percentage of population without AAPB have pancreaticobiliary reflux and whether the reflux is relevant to biliary carcinogenesis.

This new method has many advantages. First, it involves the use of pancreatic juice as an intrinsic imaging agent that

enables assessment of pancreatic juice movement under natural conditions unlike MRCP examination after secretin injection, because unlike with normal dietary intake, injection of secretin may enhance stimulation of pancreatic juice excretion. In addition, because this method is not time consuming, it can be used in conjunction with routine MR examination, and thus, aid in screening of patients with chronic pancreatitis or pancreatic juice reflux.

In conclusion, direct visualization of pancreatic juice movement by MR imaging can be used in the functional diagnosis of pancreatobiliary disease. Chronic pancreatitis and pancreatic juice reflux can also be diagnosed using this new technique. I hope that this method will expand in application to elucidate the mechanism of pancreatobiliary diseases.

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