Redefining MRI:
From Image to Insight

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Functional and Quantitative MRI in Pancreatobiliary Diseases

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While conventional MRI plays an important role in the morphologic assessment of pancreatobiliary diseases, it provides limited information regarding the underlying histopathological alterations, physiological changes, or functional abnormalities of the pancreatobiliary system. Recent developments in functional and quantitative MRI have enabled comprehensive assessment of these pathophysiological features beyond structural imaging alone.
This lecture will review functional and quantitative MRI approaches for pancreatobiliary diseases, focusing on cine-dynamic magnetic resonance cholangiopancreatography (MRCP), T1 mapping, and proton density fat fraction (PDFF). Cine-dynamic MRCP with a spatially selective inversion-recovery pulse can directly and noninvasively visualize pancreatic juice and bile flow dynamics. This technique provides insights into physiological flow patterns, aging-related changes, and altered flow dynamics in various pathological conditions, including ductal dilatation, cholelithiasis, chronic pancreatitis, and other pancreatobiliary disorders. Its potential role in evaluating pancreatic exocrine function and sphincter of Oddi function will also be discussed.
Quantitative MRI provides complementary information regarding pancreatic tissue characteristics. T1 mapping enables quantitative assessment of pancreatic T1 values, which have been associated with fibrosis and chronic inflammatory changes, while PDFF enables quantitative assessment of pancreatic fat deposition. The relationships between these quantitative biomarkers and pancreatic endocrine and exocrine function will be considered.
Finally, multiparametric MRI findings in diabetes mellitus will be presented as an example of integrated functional and quantitative assessment. Different MRI biomarkers may reflect distinct aspects of pancreatic pathology, including pancreatic dysfunction and underlying tissue alteration. The integration of functional and quantitative MRI may improve our understanding of pancreatobiliary pathophysiology beyond conventional morphologic imaging.

Keywords: *Pancreatobiliary diseases, Cine-dynamic MRCP, T1 mapping, PDFF*