Editorial for "Quantitative T2 Mapping of Acute Pancreatitis"

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Two thirds of patients diagnosed with acute pancreatitis (AP) have a benign outcome. The severe form of AP characterized by infection of the pancreas and peripancreatic tissues as well as persistent organ failure has a mortality rate of up to 40%. Diagnosis of AP is based on clinical parameters, elevated serum lipase or amylase levels and imaging. However, reliable classification into mild, moderate, and severe AP requiring different therapeutic approaches is not straightforward due to variable etiology, comorbidities, organ involvement and clinical course.

Imaging is necessary to distinguish between interstitial/edematous AP and necrotizing AP, to help understand etiology and rule out complications. Ultrasound and contrast enhanced computed tomography (CT) are the most frequently employed imaging modalities in the diagnostic work-up of AP, while CT and MRI are more reliable for the investigation of AP complications and the follow-up of the disease. A CT based severity index (CTSI) has been introduced and later modified to include extrapancreatic complications. The CTSI correlates well with indices of disease severity such as duration of hospital stay, incidence of infections and the need for surgical interventions. However, due to subjective rating of radiologic features the interobserver agreement for classification of AP based on CTSI is below 80%.

MRI is considered more reliable for the detection of necrotizing lesions and pancreatic and extrapancreatic inflammation. For instance, diffusion weighted imaging has higher sensitivity and accuracy than CT to detect infected necrotic or fluid collections.(1) An MR severity index (MRSI) has been proposed which is mainly based on T_1 weighted MRI (fat suppressed and contrast enhanced) and T_2 weighted

cholangiopancreatography.(2, 3) The MRSI reaches a sensitivity of approximately 80% and specificity can be increased when combining the MRSI with the Acute Physiology and Chronic Health Evaluation II score. Interobserver agreement is also higher for the MRSI than for the CTSI.(3)

Quantitative imaging parameters accessible by MRI have the advantage of being more objective and comparable between centers and time points. The added value of quantitative parameters such as T_1, T_2 and T_2* relaxation time constants, magnetic resonance elastography derived stiffness indices, extracellular volume fraction, fractional anisotropy, apparent diffusion coefficient, blood flow and fat fraction has been investigated in pancreatic diseases, including for the distinction between interstitial and necrotizing AP.(1, 4, 5) Increased T_1 is indicative of fibrosis; T_2* is shortened in hemorrhagic lesions and iron overload. Inflammation results in edema formation and the expected increase in relaxation time constants has indeed been observed in inflammatory pancreatic diseases including AP(6, 7) as well as in corresponding animal models with histologically confirmed pathophysiology.(8, 9)

Accurate and reliable relaxometry is challenging in the pancreas due to different degrees of fat infiltration, and respiratory and peristaltic motion.(6) It is also hampered by the lack of standardized acquisition sequences which in turn mitigates the gain in reproducibility and objectivity.

The potential of quantitative mapping of relaxation time constants for monitoring disease progression and treatment response in patients with AP has yet to be confirmed. The recent study by Porões et al(10) is a first important step towards this goal. It uses an advanced acquisition and reconstruction technique which generates T_2 weighted images by echo sharing of a radially acquired data set to enable reliable

T_2 mapping under free breathing with good spatial resolution, whereas the central part of k-space is filled with data acquired at specific echo times. The study reveals a strong positive correlation between the pancreatic T_2 value and the presence of inflammation as evaluated by pancreatic enlargement and/or surrounding fat stranding on CT. It also reveals associations with various clinical outcome indicators indicating its prognostic value.

Once appropriate and standardized MRI acquisition techniques become available on clinical MRI scanners it can be expected that the addition of quantitative MRI parameters to the MRSI improves the interobserver agreement and the classification of AP allowing prompt and targeted therapeutic interventions.

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