Editorial for "Prospective Evaluation of Virtual MR Elastography With Diffusion Weighted Imaging in Subjects With Nonalcoholic Fatty Liver Disease"

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NAFLD (Nonalcoholic fatty liver disease) is an important cause of chronic liver injury with increasing incidence with the development of type 2 diabetes and obesity. Assessment of the severity of liver fibrosis is a major issue in the staging of NAFLD and requires non-invasive diagnostic methods beyond invasive biopsy and histopathology.[1] Magnetic resonance elastography (MRE) is considered as the most accurate non invasive method of liver stiffness measurement in NAFLD.[2] This technique is available from several manufacturers of MRI scanners as an option that includes special hardware and software. Diffusion weighted imaging (DWI) has also been used as the motion of water protons is sensitive to the tissue structure and fibrosis and because DWI is widely available and easily implemented in routine liver MRI.[3] Diffusion weighted imaging has been explored in various liver diseases for its ability to stage the pathology.[4] Overall the ability of diffusion imaging to stage acurately fibrosis is varying between studies and pathologies with moderate diagnostic accuracy compared with MRE. The interest in having a non-invasive method to assess liver fibrosis without specific hardware and software for elastography has pushed towards improving existing methods. Le Bihan et al proposed the calculation of a shifted apparent diffusion coefficient (sADC) from diffusion MR imaging signals acquired with b values of 200 and 1500 sec/mm^2, optimized to reflect Gaussian and non-Gaussian diffusion.[5] sADC was significantly correlated in the liver to standard elastographic shear modulus and can be converted to a diffusion-based shear modulus.[5] This

« virtual magnetic resonance elastography » (VMRE) has shown promising results compared to MRE in patients with chronic liver disease and was proposed as an alternative to MRE.[6]

In this context it is known that hepatic steatosis may have an effect similar to that of fibrosis on diffusion parameters and may be a counfounding factor, as demonstrated in several studies in patients with different forms of hepatitis.[7] Hepatic steatosis is significant in NAFLD population and in this issue of JMRI the authors report an interesting study to account for the effect of hepatic steatosis on sADC and Virtual magnetic resonance elastography (VMRE) measurements.[8] The authors sought to correct VMRE for the presence of fat and to compare its performance in staging fibrosis to that of MRE, with biopsy as the reference standard. They perform a prospective study with a well characterized and homogeneous group of 49 patients with complete histopathological reports, MR imaging and blood markers. NAFLD is confirmed by histology in 43 of these patients. Steatosis is assessed with Proton Density Fat Fraction (PDFF) maps generated with IDEAL-IQ pulse sequence in patients showing different degrees of steatosis. sADC values is corrected for the influence of unsuppressed fat or not. The sADC is negatively correlated with PDFF. The main result is that MRE correlates well with fibrosis stage while sADC does not and neither uncorrected nor corrected VMRE correlates significantly with MRE.

These results should not compromise the interest of using VMRE in NAFLD patients but suggest that further evaluation is required. As underlined by the authors it may be necessary to derive a different relationship between sADC and MRE shear modulus in patients with significant hepatic steatosis. Another perspective suggested by the

authors is to assess whether approaches based on intravoxel incoherent motion diffusion-weighted imaging (IVIM) would be more robust.[5,9] Beyond fibrosis there is a growing interest in assessing the full spectrum of NAFLD by multiparametric MRI to better evaluate the stage of the disease.[10]

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