Editorial

An interesting approach for the diagnosis of hepatic fibrosis: Wáng *et al.*, "A combined use of intravoxel incoherent motion MRI parameters can differentiate early-stage hepatitis-b fibrotic livers from healthy livers"

Jean-Pierre Cercueil

Department of Vascular and Interventional Radiology, François-Mitterrand Teaching Hospital, University of Burgundy, Dijon, France.
Correspondence to: Dr. Jean-Pierre Cercueil. Department of Vascular and Interventional Radiology, François-Mitterrand Teaching Hospital, University of Burgundy, Dijon, France. Email: jpcercueil@gmail.com.

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Since its description in 1986 by Le Bihan *et al.*, intravoxel incoherent motion (IVIM) diffusion MR imaging has made great progresses (1-4). Many studies demonstrated the influence of various pathologies on the diffusion parameters especially in case of cirrhosis and fibrosis. However, few of them are useful at the individual level because of the variability of IVIM values (5). It is indeed very difficult to measure precisely PF and Dfast (6,7). Many published work tried to improve the precision of the measurements, tries to better understand the diffusion patterns, improve the image acquisition sequences or image post-processing. Unfortunately, till today, the reproducibility of the IVIM diffusion measures remain insufficient for daily clinical applications (5). Much progress remains to be made to achieve more reproducible results from one team to another or one scanner to another.

Recently, Wáng and colleagues provided a particularly interesting work on application of IVIM diffusion imaging for the diagnosis of hepatic fibrosis without steatosis (8). The methodology used is original. It differs from the method of principal component analysis which is most classical and most multi-purposed (9). The method used by Wáng and colleagues was adapted for the study of three parameter of IVIM, easy to understand and very demonstrative (8). Wáng and colleagues' results are particularly compelling to differentiate patients without liver fibrosis and patients with F1 or F2 fibrosis (AUC respectively 0.986 and 1) in cases of viral hepatitis. It is one of the few publications where it is possible to have sufficient diagnostic reliability at individual patient level with IVIM diffusion imaging.

In the discussion the authors noted that values of PF (f) and especially Dfast (D*) were lower than those published in the literature (8). One possible explanation could be that the equation of IVIM model is imperfect. As we have highlighted, there could be actually not one but at least two compartments of micro-perfusion (6). Each compartment has its own circulatory system. Wáng and colleagues have only acquired *b*-values greater than 10 and may have promoted the slowest compartment (probably the space of Disse) during the analysis. This makes sense in the cases of fibrosis that this space is reduced in volume due to fibrosis and the circulatory speeds are slower due to portal hypertension. This point is very interesting and should be confirmed by more purposed designed studies.

This multi-factor analysis approach used by Wáng and colleagues needs to be confirmed by a prospective study and by other teams. This work also highlights the importance to improve the reliability of the measurement of diffusion parameters. In clinical practice, a non-invasive imaging method is very important for the diagnosis and monitoring of hepatic fibrosis. In cases associated with various pathologies, each pathology may modify IVIM parameters, and the final interpretation may be rather complex (10). It would be especially the case when steatosis is associated with fibrosis in NASH syndrome. In these circumstances maybe only a multi-parametric approach can allow pathologies to be assessed correctly.

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Footnote

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