Strain ultrasound elastography for liver diseases

To the Editor:

In a review published in a recent issue [1], Van Beers *et al.* described the new ultrasonography and magnetic resonance imaging (MRI) techniques for the evaluation of diffuse and focal liver diseases. Regarding the section of ultrasound elastography, however, the authors failed to include strain elastography (SE), which is also one of the important elastography techniques for liver disease [2–4].

Unlike shear wave based elastography, SE measures the strain response of tissue to stress such as manual compression or cardiovascular pulsation. Since soft tissue can be more easily compressed than hard tissue, the strain response can reflect the tissue stiffness, which is displayed on ultrasonography as a colour map overlaid to the grey scale image. Both qualitative and (semi-)quantitative methods have been developed in SE to analyze the tissue elasticity. The former analyses the colour distribution (pattern) within a region of interest (ROI), while the latter is performed either with strain histogram (SH) which computes the strain values of elemental areas inside a ROI or with strain ratio (SR) which measures the relative strain between two areas inside a ROI [5].

Liver fibrosis is shown as uneven, patchy colour distribution on SE since the hardness of hepatic tissue is irregular, and the areas of low strain increase with the progression of liver fibrosis [3]. SE with quantitative methods has also been studied for assessing liver fibrosis. For patients with chronic virus hepatitis C, there is a significant correlation between the histological fibrosis stage and the SR, which is either the ratio of intercostal muscle/liver parenchyma (the median SR for F0, F1, F2, F3, F4 were 1.56, 1.36, 1.03, 0.62, and 0.45, respectively) [6] or the ratio of small hepatic parenchyma/intrahepatic veins (the cut-off values of SR were 2.79 for F $\geqslant$2, 3.25 for F $\geqslant$3, and 3.93 for F = 4) [7]. When SH was used, the area under the receiver operating characteristic curves (AUROC) was 0.93 for F $\geqslant$3 and 0.91 for F = 4 for the SH to predict fibrosis stage [8]. For patients with chronic virus hepatitis B, promising results were also reported. In a study using SH and quantitative parameters (elasticity index), the AUROCs for the diagnosis of F $\geqslant$1, F $\geqslant$2, F $\geqslant$3, and F = 4 were 0.93, 0.92, 0.84, and 0.66, respectively [9].

A study compared the diagnostic performance of SE, transient elastography (TE) and acoustic radiation force impulse imaging (ARFI). Results showed that TE and ARFI performed slightly better than SE in predicting significant fibrosis (AUROC = 0.751, 0.897, and 0.815 for SE, TE, and ARFI, respectively), however, there were no significant differences among the three techniques in diagnosing cirrhosis (AUROC = 0.852, 0.922, and 0.934 for SE, TE, and ARFI, respectively) [10].

The European and Romanian elastography guidelines suggest that further research on assessing liver fibrosis with SE are still needed to provide more evidence [2,4], but the Japanese elastography guidelines state that SE accurately measures liver fibrosis [3]. Considering that SE has been broadly discussed as one of the main elastography techniques besides TE, ARFI and supersonic shear imaging for assessing liver stiffness in the international guidelines [2–4], we conclude that SE should not be excluded in this comprehensive review.

Conflict of interest

We declared that we do not have anything to disclose regarding funding or conflict of interest with respect to this manuscript.

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