

NON-INVASIVE DETECTION OF LIVER FIBROSIS- A COMPARISON STUDY BETWEEN MR ELASTOGRAPHY AND DIFFUSION WEIGHTED MR IMAGING

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Purpose:

Comparative evaluation of Magnetic Resonance Elastography (MRE) and Diffusion Weighted Imaging (DWI) for the detection of liver fibrosis.

Methods:

The study group consisted of 20 healthy volunteers and 30 patients. All volunteers and patients underwent MRI of the liver with MRE and DWI sequences. The indications for the liver MRE in patients were chronic liver disease in 25 patients and liver tumour in five patients. Both DWI and MRE were performed in the same sitting on a 1.5 Tesla clinical MR scanner. In case of normal volunteers, DWI and MRE were performed after acquisition of T2 weighted and T1- weighted axial sequences. In the patients group DWI was done before the gadolinium enhanced sequences as per our institution protocol and MRE was performed at the end of the MRI study. DWI was performed with a free breathing technique (TR/TE 5000-6000/91ms, matrix 160 x 160, 5mm thickness, b=0,500, NEX= 6). The apparent diffusion coefficient (ADC) maps were generated on the workstation. MRE was performed with a modified phase-contrast gradient-echo sequences with TR/TE=100/27ms, matrix 96 x 256, 4 x 10 mm slices, interslice gap 5 mm. The MRE software automatically generated stiffness maps (elastograms) for each slice of MRE. Regions of interest (ROI) were drawn on the elastograms and ADC maps excluding large vessels, liver edges, and artifacts if any and every attempt was made to match the ROIs on ADC maps and elastograms wherever possible. Mean stiffness values in kilopascals (kPa) and mean ADC values ($10^{-3}\text{mm}^2/\text{s}$) were derived for each subject. The diagnosis of fibrosis was established at histology in the entire patients group. No liver biopsy was performed in the volunteer group. The fibrosis was graded according to the METAVIR score. Receiver Operating Curve (ROC) analysis was performed to determine the area under curve (AUC) for accuracies of both MRE and ADC for detection of liver fibrosis and for detection of clinically significant fibrosis (METAVIR score >F2)

Results

Both DWI and MRE were successfully performed in all patients and normal volunteers. All studies were considered good quality for analysis. ROC analysis showed that for the detection of liver fibrosis, AUC/sensitivity/specificity for MRE (cut off, >2.52 kPa) and DWI (cut off, <116.63 x $10^{-3}\text{mm}^2/\text{s}$) were 0.99/95.6%/95% and 0.84/82.3%/86.7% respectively. The accuracy of MRE was significantly better than DWI (p=0.035). MRE also performed significantly better than DWI for detection of clinically significant fibrosis AUC 0.97 (95% CI, 0.88, 100) vs. 0.79 (95% CI, 0.63, 0.90) (p=0.005).

Conclusions

MRE is more accurate non-invasive technique than DWI for detection of all grades of liver fibrosis and in particular clinically significant fibrosis.