

Liver magnetic resonance elastography: reproducibility, predictive factors of failure and new sequences evaluation

Mathilde Wagner

Paris

Magnetic resonance elastography (MRE) is an imaging technique which assesses the visco-elastic properties of tissues. It is based on the analysis of the tissue's displacement secondary to a mechanical excitation. It is mainly and daily used for liver fibrosis diagnosis and staging, with excellent accuracy. First, we assessed the reproducibility of this imaging technique in a prospective study involving 12 subjects (5 volunteers and 7 patients with liver disease). An MRE acquisition was performed using 2 different systems (1.5T Siemens system and 3T GE system) and the image analysis was done by 2 readers. We showed that there was excellent interplatform reproducibility and excellent intra- and interobserver reproducibility for liver stiffness measurement ($ICC > 0.97$, $CV < 11.5\%$). Second, we assessed the causes of technical failure of this imaging method in a cohort of 781 examinations in 691 patients. All the examinations included an MRE acquisition using a commercially available GRE sequence. The technical failure rate for MRE exams at 1.5T was 4%, while it was higher, 15%, at 3.0T. On multivariable analysis, BMI, liver iron deposition, massive ascites and use of 3.0T were significantly associated with MRE failure ($P < 0.004$). These results encourage the use of alternative sequences at 3.0T. Finally, we compared 2 different MRE sequences (gradient recalled echo [GRE] and spin echo echoplanar imaging [SE-EPI]) of the liver in terms of image quality and quantitative liver stiffness measurement. We performed a prospective study, which involved 50 consecutive subjects. There were 4 cases of failure with GRE-MRE and none with SE-EPI-MRE. Image quality scores and region of interest size (which reflects the quality of the acquisition) were significantly higher using SE-EPI-MRE versus GRE-MRE ($P < 0.0001$). Liver stiffness measurements were not significantly different between the 2 sequences ($P = 0.062$), were significantly correlated ($ICC = 0.909$), and had excellent reproducibility ($CV = 10.2\%$). Our data suggest that SE-EPI-MRE may be a better alternative to GRE-MRE.