Liver cT1 predicts clinical outcomes in patients with chronic liver disease, equivalent to liver biopsy

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The magnetic resonance imaging (MRI) parameter T_1, when corrected for iron content (cT_1) can quantify extracellular water content, which rises with fibrosis and inflammation. We have previously shown that liver cT1 correlates with histological fibrosis and ballooning. In this study we examine liver cT1 as a prognostic biomarker to predict clinical outcomes.

Patients with varying liver disease aetiologies underwent multiparametric imaging (T1, T2* mapping (iron) and MR spectroscopy (fat). Liver*MultiScan*^{TM} software was used to obtain cT_1 maps of the liver and calculate the mean cT_1 value from 3 regions of interest (ROIs) placed in the liver parenchyma.

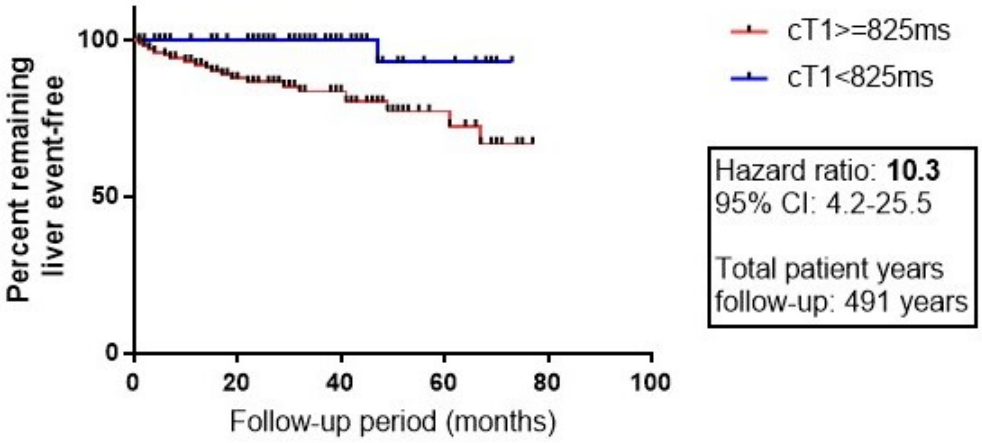
Patients were followed up for development of clinical outcomes by review of their medical records blinded to the imaging results. All-cause mortality, liver mortality, liver transplantation and liver-related events (ascites, variceal bleeding, hepatic encephalopathy, hepatocellular carcinoma) were considered as clinical endpoints. Analysis was carried out for mortality and liver event-free survival. Patients who developed multiple endpoints were censored at the index event for liver event-free survival analysis.

166 patients were followed up for 491 patient-years (median (IQR) 35 (18-49) months). 103 (62%) patients were male; mean age (±SD) was 52 (±13) years. Liver biopsy was performed in 150 patients. Histologic fibrosis assessment by Ishak staging was mild (F0-2) in 78 (53%), moderate (F3-4) in 22 (15%) and severe (F5-6) in 50 (34%) patients. Main diagnoses were viral hepatitis (n=40, 24%), NAFLD (67, 41%) and alcohol related liver disease (27, 16%). 21 new liver-related events occurred during follow-up, including 15 deaths.

Using the equivalent cut-off (Pavlides et al, 2016), cT1 could significantly differentiate between all-cause mortality (p=0.020), liver-related mortality (p=0.026) and liver event-free survival (p=0.005; Fig 1). In univariate Cox regression analysis for the prediction of all liver events, cT1≥825ms had a hazard ratio (HR) of 10.3. Fibrosis measured by Ishak F5-6 had a HR of 9.8. cT1 correctly classified 20/21 liver events; liver iron and fat did not predict clinical outcomes. 3 patients with F1-2 progressed to a liver event, as well as 16 patients with F5-6.

We provide further evidence that liver cT1 can predict clinical outcomes in a larger cohort of patients with chronic liver disease of mixed aetiologies, equivalent to the predictive ability of liver histology.

Liver event-free survival (cT1)



Liver event-free survival (Ishak stage F5-6)