Background and Aims: The magnetic resonance imaging (MRI) parameter T1, when corrected for iron content (cT1) can quantify extracellular water content, which rises with fibrosis and inflammation. We have shown liver cT1 correlates with histological fibrosis and ballooning. Here 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*™ software was used to obtain cT_1 liver maps and calculate the mean cT1 value from 3 regions of interest (ROIs) placed in the liver parenchyma**.**

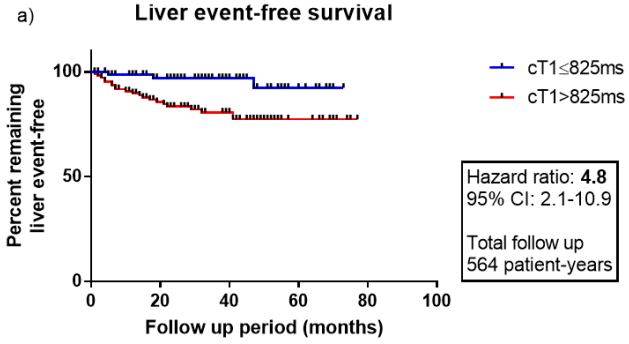
Method: Patients were followed up for development of clinical outcomes by review of their medical records blinded to the imaging results. All-cause mortality, liver mortality, liver transplantation and liver-related events (ascites, variceal bleeding, hepatic encephalopathy, hepatocellular carcinoma) 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.

Results: 190 patients were followed up for 564 patient-years (median (IQR) 35 (19-51) months). 119 (72%) patients were male; mean age (± SD) was 52 (± 13) years. Liver biopsy was performed in 165 patients. Histologic fibrosis assessment by Ishak staging was none/mild (F0-2) in 85 (52%), moderate (F3-4) in 25 (15%) and severe (F5-6) in 55 (33%) patients. Main diagnoses were viral hepatitis (n = 54, 28%), NAFLD (70, 37%) and alcohol related liver disease (26, 14%). 24 new liver 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 ($p = 0.021$), liver-related mortality ($p = 0.010$) and liver event-free survival ($p = 0.005$; Fig 1a). For prediction of liver events, cT1 > 825ms had a hazard ratio (HR) of 4.8 and correctly classified 21/24 (88%) liver events; liver iron and fat did not predict clinical outcomes. In NAFLD/ALD/HCV/HBV patients (n=150), cT1 > 825ms correctly classified 17/17 liver events ($p = 0.001$; Fig 1b). ISHAK F5-6 predicted liver event-free survival ($p < 0.001$, HR: 19) correctly classifying 18/21 (86%) events.

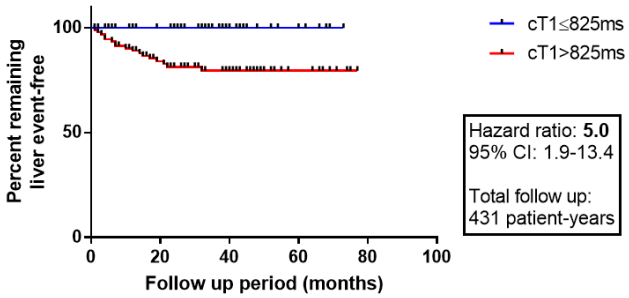
Conclusion: We provide further evidence that liver cT1 can predict clinical outcomes in a larger cohort of patients with chronic liver disease of mixed aetiologies and particularly well in NAFLD, ALD and HCV/HBV patients.

Figure:

a)


Liver event-free survival
Percent remaining liver event-free
100
50
0
0
20
40
60
80
100
Follow up period (months)
cT1≤825ms
cT1>825ms
Hazard ratio: 4.8
95% CI: 2.1-10.9
Total follow up
564 patient-years

b)


NAFLD, ALD and HCV/HBV
Percent remaining liver event-free
100
50
0
0
20
40
60
80
100
Follow up period (months)
cT1≤825ms
cT1>825ms
Hazard ratio: 5.0
95% CI: 1.9-13.4
Total follow up:
431 patient-years