

Diagnosis of hepatic siderosis with a novel breath-hold multi-echo T2* sequence in patients with chronic liver disease.

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Introduction:

Hepatic iron deposition is suspected to play an important role in pathophysiology of liver fibrosis in viral and alcoholic hepatitis (1, 2), and some investigators have proposed treating these patients with iron chelating agents. Core liver biopsy is considered to be the reference for iron detection and quantification (3), however it is limited by potential risks and sampling error. MRI has been used as a non invasive tool for detection of liver siderosis using GRE sequences (4, 5). The objective of our study was to assess a novel breath-hold multi-echo T2* sequence for detection of liver siderosis and compare it to in- and out-of-phase T1 GRE sequence using histopathology as the reference.

Methods:

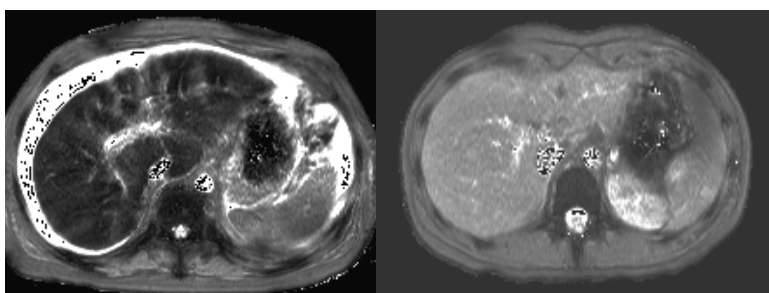
In this HIPAA compliant retrospective study we identified 22 patients (17 male, 5 female, mean age 56 y) with chronic hepatitis who had either liver explant (n = 8), liver resection (n =1), or liver biopsy (n =13). The patients underwent 1.5T liver MRI (Avanto, Siemens Medical Solutions) using a routine protocol including in- and out-of-phase T1 GRE [TR 180, TE 2.4 (out-of-phase)-4.2 (in-phase), FOV 208 x 256, slice thickness 8 mm] and axial BH multi-echo T2* GRE (TR 169, TE 4.8-28.7, slice thickness 10 mm, FOV 400x 400, 10 slices, acquisition time 16 sec.) within 90 days of pathology. T2* maps were obtained on a commercial workstation. ROIs were drawn by an observer on the liver and paraspinal muscles to measure T2* values. The following were calculated: 1) liver T2*, 2) ratio T2* liver/T2* muscle (%), 3) IF-IOP (iron fraction with in and out-of-phase imaging) = SI Liver (Out - In)/Out *100. Liver iron deposition was quantified by an expert hepatopathologist using a 5-scale grade (0-4).

Table 1	No hepatic iron (grade 0)	Hemosiderosis (grade 1-4)	p
Liver T2* (msec)	31.7 ± 5.15	16.6 ± 6.8	<10 ⁻⁵
Liver/Muscle T2* (%)	123 ± 25	64 ± 24	<10 ⁻⁴
IF-IOP (%)	3 ± 3.3	16.9 ± 15.7	<10 ⁻²

Table 2	Sens.	Spec.	PPV	NPV	Accuracy
Liver T2* (<24 msec)	90%	100%	100%	92 %	95.5%
Liver/Muscle T2* (<93%)	100%	92%	91%	100%	95.5%
IF-IOP (>6%)	72%	92%	88%	79%	81.8%

Results: 12 patients had no hepatic iron (grade 0) and 10 patients had liver siderosis (grade 1-4). There was a significant difference in liver T2*, liver to muscle T2* ratio, and IF -IOP in patients with liver iron versus patients without hepatic iron (Table 1). Performance of each method for detection of liver siderosis (grade 1-4) is shown in Table 2, we obtained excellent sensitivity and specificity using the T2* compared to IOP.

Discussion: Breath-hold T2* multi-echo sequence has a high accuracy for detection of liver iron deposition. Our results are comparable to those published in the literature (4), with the advantage of a shorter acquisition time. This sequence has the potential to replace core liver biopsy for diagnosing liver hemosiderosis.



T2* maps in a patient with grade 3 hemosiderosis (left, liver T2*=11.2 msec) and a patient with no hemosiderosis (right, liver T2*= 35.9 msec).

References:

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2. Purohit V et al. Alcohol 2003 ; 93-97
3. Barry M et.al. Lancet 1971; 100-103
4. Gandon Y et al. Lancet 2004 ; 357-362
5. Alustiza J et al. Radiology 2004; 479-484