006 ROLE OF T1 MAPPING AS A COMPLEMENTARY TOOL TO T2* FOR NON-INVASIVE CARDIAC IRON OVERLOAD ASSESSMENT

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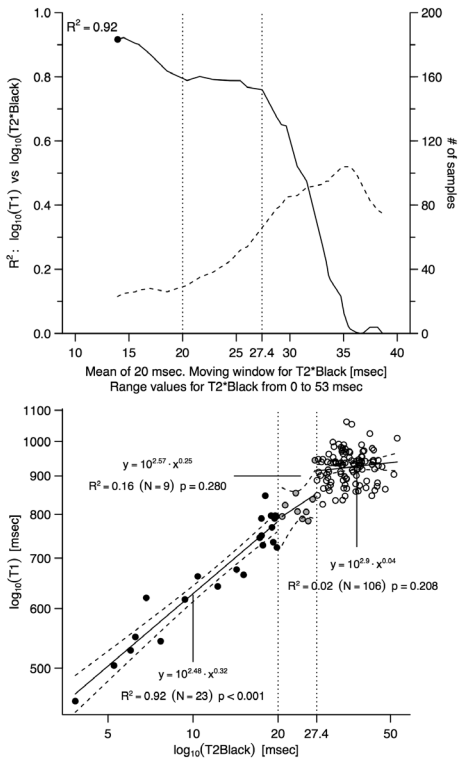
Background Iron overload-related heart failure is the principal cause of death in transfused Thalassemia Major[1–2] and other iron overload patients. Linking cardiac siderosis measured by T2* to therapy improves outcome in Thalassemia Major. Aim of our study is to compare T1 mapping (Modified Lock Locker Inversion recovery, MOLLI) to dark (DB) and bright (BB) blood T2*[3–4] in cardiac iron overload and to support the hypothesis that T1 mapping has higher sensibility to T2* for small amount of iron, which would make it a complementary tool to T2* in borderline iron overload patients.[5–6]

Methods In a prospectively large single centre study of 138 Thalassemia Major patients and 32 healthy controls, we compared MOLLI to DB and BB T2* acquired on an Avanto 1.5T scanner (Siemens Healthcare, Erlangen, Germany). Linear regression analysis was used to assess the association between DBT2* and either BBT2* and MOLLI, and the determination coefficient was computed in a log-log scale with moving windows to detect the point where this association decreases.



Abstract 006 Figure 1

Results The relationship between T2* (here DB) and MOLLI is described by a log-log linear regression, which can be split in three different slopes: 1) T2* low, <20ms: r2=0.92; 2) T2*=20–28 ms: r2=0.80; 3) T2*>28 ms, no relationship. All subjects with T2*<20 ms had low T1; of those with T2*>20 ms, 38% had low T1.

Conclusions These data support the former proposal that T1 detects missed iron 1 in 3 subjects with normal T2* and that T1 mapping is a complementary tool for non-invasive assessment of cardiac iron. The clinical significance of a low T1, normal T2* should be further investigated. A trend toward LV end diastolic volume increase was observed in the patients with low T1 and normal T2* at 24 months, but the sample was too small to be analysed (n=9).

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007 COMPREHENSIVE ECHOCARDIOGRAPHIC AND CARDIOVASCULAR MAGNETIC RESONANCE EVALUATION DIFFERENTIATES BETWEEN PATIENTS WITH HEART FAILURE WITH PRESERVED EJECTION FRACTION, HYPERTENSIVE PATIENTS AND HEALTHY CONTROLS AND IDENTIFIES THOSE WITH REDUCED EXERCISE CAPACITY ON CARDIOPULMONARY EXERCISE TESTING

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Objectives The aim of this study was to investigate the utility of a comprehensive imaging protocol including echocardiography and cardiovascular magnetic resonance (CMR) in the diagnosis and differentiation of hypertensive heart disease and heart failure with preserved ejection fraction (HFpEF).

Background Hypertension is present in up to 90% of patients with HFpEF and is a major aetiological component. Despite current recommendations and diagnostic criteria for HFpEF, no non-invasive imaging technique has as yet shown the ability to identify any structural differences between patients with hypertensive heart disease and HFpEF.

Methods We conducted a prospective cross-sectional study of 112 well-characterised patients (62 with HFpEF, 22 with hypertension and 28 healthy controls). All patients underwent cardiopulmonary exercise and biomarker testing and an imaging protocol including echocardiography with speckle tracking analysis and CMR including T1 mapping pre- and post-contrast.

Results Echocardiographic global longitudinal strain (GLS) and extracellular volume (ECV) measured by CMR were the only variables able to independently stratify between the three groups of patients. ECV was the best technique for differentiation between hypertensive heart disease and HFPEF (AUC 0.88; GLS AUC 0.78, p<0.001 for both). Using ECV, an optimal cut-off of 31.2% gave 100% sensitivity and 75% specificity. ECV was significantly higher and GLS was significantly reduced in subjects with reduced exercise capacity (lower peak VO2 and higher VE/VCO2).

Conclusions Both GLS and ECV are able to independently discriminate between hypertensive heart disease and HFpEF and identify patients with prognostically significant functional limitation. ECV is the best diagnostic discriminatory marker of HFpEF and could be used as a surrogate end-point for therapeutic studies.

008 DEMONSTRATION OF CARDIAC AL AMYLOIDOSIS REGRESSION AFTER SUCCESFUL CHEMOTHERAPY. A CMR STUDY

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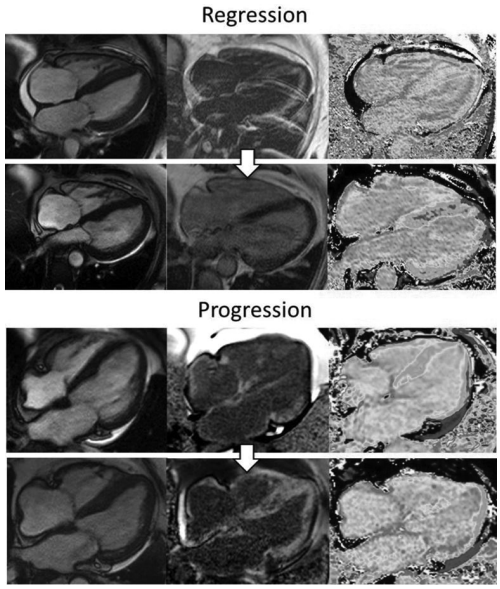
Background Cardiac involvement in immunoglobulin light chain (AL) amyloidosis is the major determinant of survival; Cardiac response to chemotherapy is conventionally assessed by serum brain natriuretic peptide (NT-proBNP) and echocardiography, but neither quantify amyloid burden. The aim of this study was to evaluate cardiac AL amyloid serially using cardiovascular MR (CMR) including extracellular volume measurement (ECV), which is the site of the amyloid deposits.

Methods 31 patients with cardiac AL amyloidosis who had chemotherapy were studied serially using ECG, echocardiography, ^{123}I-labelled serum amyloid P component (SAP) scintigraphy, NT-proBNP measurements and CMR with T1 mapping and ECV measurements (mean interval 20±11 months). Nineteen patients achieved a complete or very good partial haematological response (CR n=10; VGPR n=9). Twelve patients attained a partial response (PR) or no response (NR).

Results At follow-up (mean 20±11 months), the amyloid burden had decreased substantially in 6 of the 10 (60%) attaining a CR, 6 of the 9 (67%) in VGPR and 1 of the 8 (13%) in PR. Changes in the ECV consistent with regression of amyloid were concordant with the changes in native T1, reduction in amyloid volume and in 5 patients with changes in late gadolinium enhancement pattern (figure 1). Overall there was significant reduction in NT-proBNP concentration, LV mass, left atrial area and improvement in diastolic function in patients whose amyloid burden decreased. Regression of cardiac amyloid by CMR correlated with regression of amyloid in other organs measured by SAP scintigraphy.



Abstract 008 Figure 1 Top: four chamber SSFP cine images in disatole, corresponding late gadalinium anhancement (LGE) images and ECV mapping before and after chemotherapy in a patient who had regression of amyloid burden after chemotherapy. Bottom: four chamber SSFP cine images in disatole, corresponding LGE images and ECV mapping before and after chemotherapy in a patient who had progression of amyloid burden after chemotherapy.

009 THE EFFECT OF CARDIAC MAGNETIC RESONANCE ON HUMAN CIRCULATING LEUKOCYTES

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Aims Investigators have proposed that cardiovascular magnetic resonance (CMR) should have restrictions similar to those of ionising imaging techniques due to proposed alterations to leukocytes. We aimed to investigate the acute effect of CMR on leukocyte DNA integrity and cell viability *in vitro*, and in a large cohort of patients *in vivo*.

Methods and results *In vitro* study: Peripheral blood mononuclear cells (PBMC) were isolated from healthy volunteers and assessed: 1) immediately following PBMC isolation, 2) after standing on the benchside as a temperature and time control, 3) after a standard CMR scan. Histone H2AX phosphorylation (γ-H2AX), an indicator of DNA damage, and leukocyte counts were quantified using flow cytometry. *In vivo* study: Blood samples were taken from 64 consecutive consenting patients immediately before and after a standard clinical scan. Samples were analysed for T cell count and γ-H2AX expression.

CMR scanning was associated with a significant increase in leukocyte γ-H2AX expression, indicating DNA damage occurs. We also observed a trend towards a significant decrease in absolute leukocyte numbers *in vitro* following CMR. CMR was not associated with a significant change in γ-H2AX