SEX- AND AGE-DIFFERENCES IN NATIVE T1 RELAXATION TIMES IN HEALTHY ADULTS AT 1.5 AND 3.0 TESLA

**Background** Limited information is available on sex differences in myocardial T1 relaxation times over age ranges. We used cardiac magnetic resonance (CMR) imaging at two field strengths to assess myocardial T1.

**Methods** Healthy adults underwent CMR at 1.5 Tesla (T) (Avanto) and 3.0 T (Verio). T1 maps were acquired in three short axis slices, using an optimised MOLLI investigational prototype sequence (Siemens Healthcare WIP 448). Global mean T1, in milliseconds (ms), was calculated from evaluable regions-of-interest using 16-segment model.

**Results** 84 volunteers (43 male) underwent scans 1.4 ± 1.4 days apart. Because of artefacts related to cardio-respiratory motion and susceptibility effects, 47 (3.9%) segments were excluded at 1.5 T and 81 (6.3%) segments at 3.0 T, with a preponderance occurring at the distal slice.

Age-related decrease in T1 was observed in females, whereas male T1 remained reasonably constant (Figure 1 and Table 1). At 1.5 T, amongst those <40 years T1 was higher for females (961.3 ± 19.3 ms) than males (932.0 ± 22.8 ms, p < 0.001), whereas there was no difference in those ≥60 years (937.2 ± 28.7 vs. 934.3 ± 24.3 ms, respectively, p = 0.807). Results were similar at 3.0 T; female T1 was higher at <40 years (1151.0 ± 39.3 ms vs. 1124.3 ± 31.6 ms, p = 0.087), but not at ≥60 years (1151.0 ± 39.3 vs. 1124.3 ± 31.6 ms, p = 0.087).

Regression analysis shows that at 1.5 T average T1 decreases by 5.13 ms for each additional decade (p = 0.038). An identical trend was observed at 3.0 T, with regression coefficient –0.564 ms/year approaching statistical significance (p = 0.064).

**Conclusions** In healthy adults, sex difference in global myocardial mean T1 relaxation times are observed amongst younger. This pattern is consistent across CMR field strengths. Pre- vs. post-menopausal differences in myocardial structure and function of females may explain these differences and this possibility merits further assessment.
Methods 427 subjects with a wide range of health and disease were divided into derivation (n = 214) and validation (n = 213) cohorts (Table 1 for patient characteristics). All subjects underwent T1 mapping with ShMOLLI at 1.5 Tesla for ECV quantification. Venous blood for Hct was obtained prior to scanning with 44 patients having a repeat Hct within 6 h.

ECV was calculated as: ECV = (Δ[1/T1\text{myo}] / Δ[1/T1\text{blood}]) * (1-hematocrit).

Synthetic Hct was approximated from the linear relationship between Hct and native T1\text{blood}, and used to calculate synthetic ECV. Histological validation was performed on 18 patients with severe aortic stenosis (age 71 ± 10 years, 78% male). ECV was compared with collagen volume fraction from intra-operative biopsies taken during surgical valve replacement.

Results In the derivation cohort, native T1\text{blood} and Hct showed a linear relationship (R² = 0.45; p < 0.001, Figure 1). This was used to derive synthetic Hct = 0.88 – (T1\text{blood}/3240). Synthetic ECV correlated well with ECV (R² = 0.99; p < 0.001). These results were maintained in the validation cohort. Test:retest variability of haematocrit was higher than expected (n = 44, variability 10% with Hct:Hct R² = 0.86).

Synthetic Hct showed a linear relationship (R² = 0.45; p < 0.001). This was used to derive synthetic Hct = 0.88 – (T1\text{blood}/3240).

Conclusion Synthetic ECV allows instantaneous non-invasive quantification of the myocardial extracellular space without blood sampling. Inline application of synthetic ECV may be an attractive alternative in clinical practice.

Abstract 29 Figure 1 Correlation between T1 blood and haematocrit. In the derivation cohort (n = 214), native T1 blood and hematocrit (Hct) showed a linear relationship (R² = 0.45; p < 0.001). This was used to derive synthetic Hct = 0.88 – (T1\text{blood}/3240).

Abstract 30 Figure 1 Comparison of atheroma score at baseline, 6 months and 3 years. Visit 1 = Baseline, Visit 2 = 6 months, Visit 3 = 3 years. T-bars represent 95% confidence intervals.

Conclusion Whole body contrast enhanced MRA can quantify and monitor atherosclerosis progression at 3 year follow-up even in a small cohort.

Whole Body Contrast Enhanced MRA Can Quantify and Monitor Atherosclerosis Progression

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Abstracts

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