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

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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 (1166.0 ± 41.7 vs. 1139.6 ± 26.1 ms, $p = 0.044$), but not at ≥ 60 years (1151.0 ± 39.3 vs. 1124.3 ± 31.6 ms, $p = 0.087$).

Abstract 28 Figure 1 Global myocardial T1 relaxation times.

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.

Abstract 28 Table 1 Global myocardial T1 relaxation times (mean $\pm$ SD, ms)

	1.5 T		3.0 T	
	Men	Women	Men	Women
Age <40, y (n = 36)	932.0 $\pm$ 22.8	961.3 $\pm$ 19.3	1139.6 $\pm$ 26.1	1166.0 $\pm$ 41.7
Age 40–59, y (n = 25)	939.8 $\pm$ 16.5	951.7 $\pm$ 27.6	1135.8 $\pm$ 31.9	1180.1 $\pm$ 24.4
Age ≥ 60 , y (n = 23)	934.3 $\pm$ 24.3	937.2 $\pm$ 28.7	1124.3 $\pm$ 31.6	1151.0 $\pm$ 39.3

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SYNTHETIC ECV – SIMPLIFYING ECV QUANTIFICATION BY DERIVING HAEMATOCRIT FROM T1 BLOOD

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Background Extracellular volume (ECV) quantification by cardiovascular magnetic resonance (CMR) measures the extracellular space. Current methodologies require blood haematocrit (Hct) correction, a barrier to easy clinical use. We hypothesised that the relationship between Hct and longitudinal relaxation time of blood ($T_{1\text{blood}}$) could be calibrated and used to generate a *synthetic* ECV without Hct.

Abstract 29 Table 1 Patient characteristics

	Derivation	Validation	p-value
Total	214	213	
Male	107	104	0.8
Age	60 $\pm$ 15	60 $\pm$ 15	0.6
BSA (m ²)	1.87 $\pm$ 0.23	1.87 $\pm$ 0.23	0.8
Healthy Volunteer	33	33	
Aortic Stenosis	62	61	
Cardiac Amyloidosis	37	37	
Hypertrophic Cardiomyopathy	34	34	
Anthracycline	48	48	
Cardiac			
EDVi (ml/m ²)	71 $\pm$ 21	70 $\pm$ 20	0.9
ESVi (ml/m ²)	25 $\pm$ 14	24 $\pm$ 13	0.5
LV mass index (g/m ²)	90 $\pm$ 35	92 $\pm$ 35	0.5
SVi (ml/m ²)	47 $\pm$ 12	47 $\pm$ 13	0.7
LVEF (%)	66 $\pm$ 12	67 $\pm$ 12	0.7
LAAi (cm ² /m ²)	14 $\pm$ 3	14 $\pm$ 5	0.5
RAAi (cm ² /m ²)	12 $\pm$ 4	12 $\pm$ 4	0.9
Clinical			
Hematocrit	0.40 $\pm$ 0.04	0.40 $\pm$ 0.04	0.4
Creatinine	79 $\pm$ 24	78 $\pm$ 21	0.9
eGFR	80 $\pm$ 23	78 $\pm$ 22	0.4
Systolic BP (mmHg)	110 $\pm$ 44	108 $\pm$ 49	0.7
Diastolic BP (mmHg)	65 $\pm$ 28	62 $\pm$ 31	0.5
T1 Mapping			
SHMOLLI ECV (%)	33 $\pm$ 10	33 $\pm$ 11	0.9

BSA, body surface area; BP, blood pressure; ECV, extracellular volume fraction; EDVi, indexed end-diastolic volume; ESVi, indexed end-systolic volume; eGFR, estimated glomerular filtration rate; LAAi, indexed left atrial area; LVEF, left ventricular ejection fraction; RAAi, indexed right atrial area; SHMOLLI, Shortened Modified Look-Locker Inversion recovery; SVi, indexed stroke volume