sequence (Siemens Healthcare WIP 448). Global (GT1), septal (ST1) and mid-septal (MST1) T1 times were calculated.

Results Indexed LVM (LVMI), T1 (Figure 1) and GLS values were higher in ESRD (Table 1). In ESRD patients T1 values positively correlated with LVMI (GT1 r^2 0.204 p = 0.008, ST1 r^2 0.201 p = 0.009, MST1 r^2 0.248 p = 0.003). Septal T1 values also positively correlated with end diastolic volumes (ST1 r^2 0.145 p = 0.029, MST1 r^2 0.213 p = 0.007). GLS also positively correlated with LVMI (GLS r^2 0.426 p = 0.013). Lower EDSR and SR tended to correlate with higher LVMI although this did not reach statistical significance (EDSR r^2 -0.342 p = 0.051, SR r^2 -0.327 p = 0.063).

Conclusions In ESRD patients, T1 relaxation times correlate with LV mass indices and end diastolic volumes, features associated with adverse outcome. GLS may be associated with adverse outcomes as it correlates with LVMI. Further work is required to explore the relationship between strain, T1 and their prognostic implications in ESRD patients.

Abstract 15 Table 1 Patient Characteristics and Cardiac Parameters

Variable	Healthy Volunteers	HD Patients	Significance (p value)
Age (years)	59.2 ± 14.0	57.8 ± 15.4	0.715
Male (%)	57.1	57.6	0.973
Global T1 (ms)	1154 ± 32	1171 ± 27	0.027
Septal T1 (ms)	1163 ± 30	1184 ± 29	0.007
Mid-septal T1 (ms)	1161 ± 29	1184 ± 34	0.006
LVMI (g/m ²)	56.9 ± 9.9	75.0 ± 18.5	<0.001
Ejection Fraction (%)	62.8 ± 6.0	63.2 ± 9.3	0.834
GLS (%)	-21.8 ± 6.2	-17.7 ± 5.3	0.007
Strain Rate (s ⁻¹)	1.06 ± 0.37	0.95 ± 0.24	0.156
EDSR (s ⁻¹)	0.97 ± 0.36	1.03 ± 0.36	0.473

Abstract 15 Figure 1 Box-plot of Mid-Septal T1 times in Healthy Volunteers and ESRD Patients

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THE CARDIAC TOXICITY CMR STUDY IN PATIENTS WITH LUNG CANCER TREATED WITH CHEMO-RADIOTHERAPY: THE CART STUDY- A SEMI QUANTITATIVE ANALYSIS OF THE MYOCARDIAL PERFUSION INDEX

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Background There are limited data on the cardiac effects of radiotherapy and chemo-radiotherapy on the heart in patients with non-small cell lung cancer (NSCLC). CART is a pilot study designed to investigate change in myocardial function and tissue properties where Patients will undergo cardiac magnetic resonance (CMR) at baseline, during treatment, at 6 weeks and at 6 months after treatment completion. Here we report our preliminary findings related to temporal changes in myocardial perfusion index (MPI).

Methods CMR was performed on a Siemens MAGNETOM Verio (Erlangen, Germany) 3.0 Tesla scanner. First-pass myocardial perfusion was assessed by saturation recovery prepared dynamic contrast enhanced sequence during administration of 0.1 mmol/kg of gadoterate meglumine (Dotarem). Semiquantitative analysis was performed on segmented basal and mid-LV short axis slices to derive normalised upslopes of myocardial signal intensity profiles (myocardial perfusion index, MPI). The change in MPI over time was analysed statistically using a linear mixed effects model.

Results 13 patients currently have undergone CMR at baseline and during treatment (mean age 66 years, SD: 9; 71% male), 8 patients have undergone CMR at 6 weeks post treatment initiation (5 patients lost to follow-up/ died), and 6 patients have undergone CMR at 6 months from baseline (n = 2 lost to

follow-up/ died). Perfusion index (Figure 1) varies significantly with time ($p = 0.0015$). After adjustment for multiple testing, the increase from baseline is statistically significant at 6 weeks ($p = 0.014$) and approaches significance at 6 months ($p = 0.074$) post treatment.

Conclusion Change in microvascular perfusion is most pronounced 6 weeks following the completion of treatment. This finding will be used in the design of future clinical studies, where measurement of MPI will provide a robust comparison of different existing and emerging treatment protocols for NSCLC with regard to their effects on myocardial physiology.

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Abstract 16 Figure 1 Boxplots of global myocardial perfusion index values by time point

17 A CASE-CONTROL STUDY WITH COMPUTATIONAL MODELLING OF ACUTE LEFT VENTRICULAR DYSFUNCTION

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Introduction The pathophysiology of acute left ventricular dysfunction after acute ST-elevation myocardial infarction (STEMI) is incompletely understood. In this study, we carried out a case-control study of left ventricular (LV) biomechanical behaviour *in vivo* using an immersed boundary-finite element (IB/FE) method. **Methods** Cardiac magnetic resonance images were acquired from six healthy volunteers (the healthy group) and six patients with acute LV dysfunction post-acute STEMI (the MI group) with no-reflow, defined as an acute reduction in myocardial blood flow despite a patent epicardial coronary artery. The two groups were age matched. The passive and active myocardial parameters were determined from the measured *in vivo* data (LV

cavity volume and strain) to match the LV dynamics in diastole and systole.

Results Student's t-test was used for significance test. Our results show that even though the average measured peak cuff-pressure in the MI group is much lower than the healthy group (122 ± 21 vs. 150 ± 20 mmHg, $p < 0.05$), the peak systolic active tension in the MI group is higher (68.9 ± 6.8 vs. 64.7 ± 8.4 kPa, $p = 0.15$), therefore the required active tension per mmHg increase is significantly higher in the MI group (0.57 ± 0.05 vs. 0.43 ± 0.05 kPa/mmHg, $p < 0.01$), which may suggest that the viable myocardium in the MI group is working harder to compensate for the loss of contraction even with much lower blood pressure. Compared to the healthy group, the MI group also has a larger end-diastolic volume (143 ± 23 vs. 122 ± 16 mL, $p = 0.09$), and a lower ejection fraction ($39 \pm 3\%$ vs. $53 \pm 2\%$, $p < 0.01$).

Conclusions In summary, we have shown for the first time that, compared with controls, patients with recent ST-elevation myocardial infarction exhibit increased active tension generation in combination with predictable changes in end-diastolic volume and ejection fraction. Active tension generation is a novel biomechanical index, and its clinical and prognostic significance merits further study.

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18 CINE-DERIVED STRAIN USING THE GLASGOWHEART METHOD

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Background The GlasgowHeart method is designed to overcome some limitations of currently available feature-tracking methods by incorporating all of the myocardial tissues using an in-house developed intensity-based b-spline deformable registration method. The aim of this pilot study was to ensure that peak circumferential strain (Ecc) estimation is feasible and reproducible with minimal intra- and inter- observer variability.

Methods 20 healthy volunteers underwent 1.5T CMR twice, < 2 days apart. Mid- LV cine sequences, were analysed with the Glasgowheart software (Figure 1). Two observers independently analysed 40 short axis slices for inter-observer variability. One observer reanalysed the 40 short axis slices. Pearson correlation and Bland-Altman analysis were used.

Results 20 participants were used in the analysis (mean age $\pm$ SD 49.5 years (17.2) 50% male). Ecc measured on the first set of MRIs by the two observers was highly correlated ($R = 0.915$, $p < 0.001$) and in excellent agreement (mean difference = 0.01; 95% LoA: -0.01, 0.02). Repeated image analysis also disclosed a high degree of association in paired measurements of Ecc that was strongly correlated ($R = 0.915$, $p < 0.001$) and in excellent agreement (mean = 0.00; 95% LoA: -0.02, 0.01). Ecc measured in the second set of MRIs by 2 observers was well correlated ($R = 0.937$, $p < 0.001$) and in excellent agreement (mean = 0.00; 95% LoA: -0.016 and 0.021). The repeated image analysis at follow-up yielded Ecc that was well correlated ($R = 0.942$, $p < 0.001$) and in excellent agreement (mean = 0.00; 95% LoA: -0.009 and 0.009). There was no difference between the average global Ecc at different time points ($p > 0.05$).