DIALYSIS – CARDIOVASCULAR COMPLICATIONS

Exploration of right ventricular haemodynamics in haemodialysis patients using cardiac magnetic resonance imaging

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Background

Cardiovascular disease (CVD) is a major cause of morbidity and mortality in haemodialysis (HD) patients. To date, much of the research on structural and functional cardiovascular disease in HD patients has focused on left ventricular (LV) abnormalities such as increased LV mass and reduced magnitudes of strain. We studied right ventricular structure and functional performance using cardiovascular magnetic resonance imaging (CMR) in this patient group.

Methods

61 HD patients and 28 age and sex -matched healthy volunteers (HV) with no history of CVD underwent 3 Tesla CMR. HD patients were scanned on a non-dialysis day. Left and right ventricular (RV) dimensions and functional data were acquired, and RV global longitudinal strain (GLS, Figure 1), a sensitive measure of systolic function, and fractional area change were assessed.

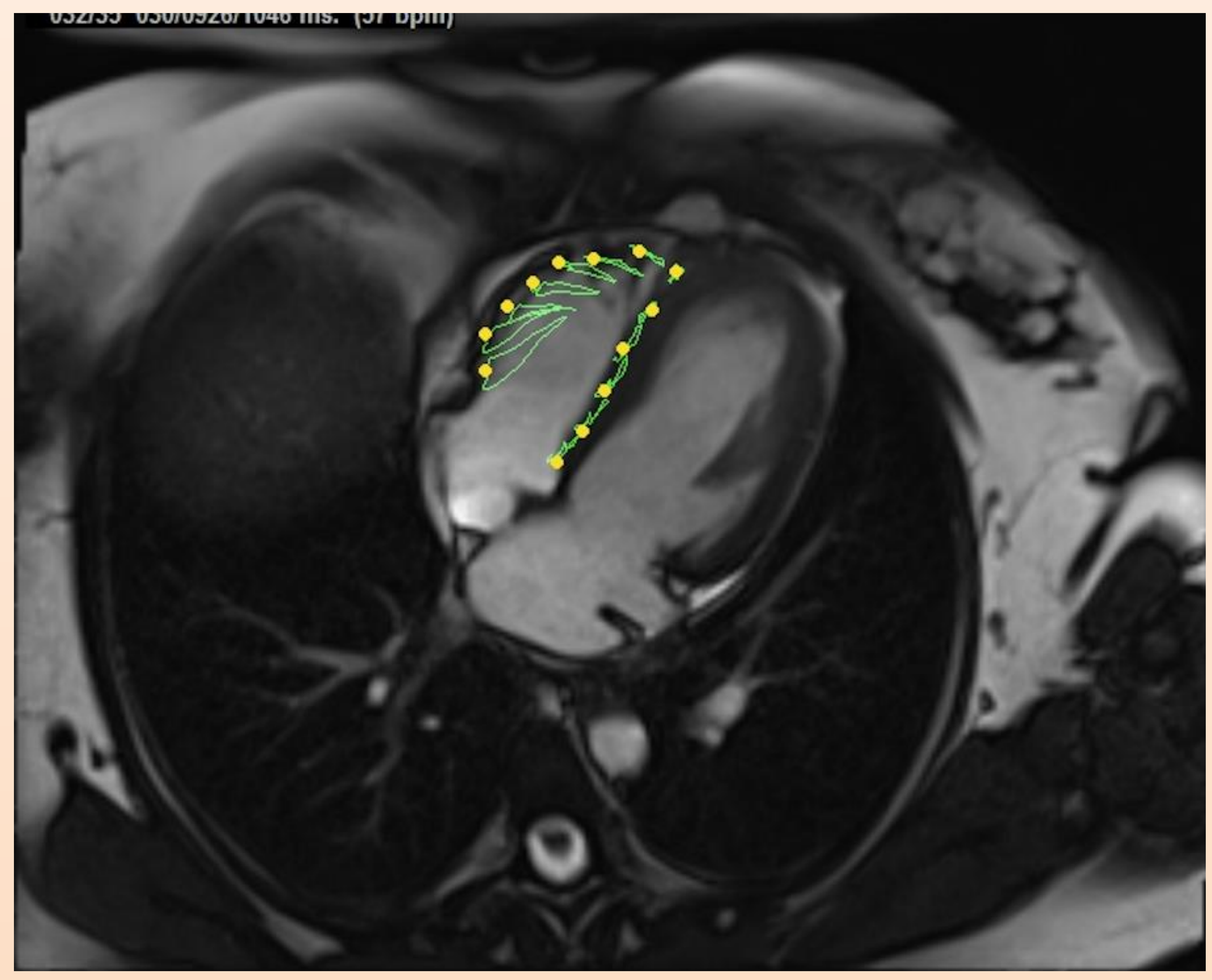

Figure 1. Right ventricular GLS analysis

Results

HD patients (57.4% male) and HV (57.1% male) were well matched for age (mean age HD 58.5 years vs HV 59.2 years). HD patients had greater LV mass (mean ± SD) (128 ± 43.8 g vs 106 ± 18.5 g, p= 0.01) compared to HV but there were no significant differences in LV ejection fraction or chamber volumes. HD patients had significant differences in RV mass compared to HV (36 ± 9.4 vs 31 ± 9.9 g, p=0.04) but no significant differences in chamber volumes were observed between groups (Table 1). Analysis of RV function revealed **significant differences in GLS (HD -33 ± 11.4 % vs HV -27 ± 6.0 %, p=0.01, Figure 2) and fractional area change (HD 55 ± 9.6 % vs HV 46 ± 9.1 %, p<0.001)**. In patients with a HD vintage of less than one year there were no statistically significant associations between ultrafiltration volume or blood pressure parameters, nor were there differences in patients with diabetes or ischaemic heart disease and those without.

	HD (n= 61)	HV (n= 28)	p
RV ESV, ml	55 ± 21	62 ± 20	0.142
RV EDV, ml	139 ± 45	151 ± 39	0.227
CO, l/min	6.3 ± 2.1	5.9 ± 2.0	0.399
SV, ml	86 ± 30	91 ± 32	0.476
RV mass, g	**36 ± 9.4**	**31 ± 9.9**	**0.04**
RV EF, %	61 ± 10.9	60 ± 12	0.815
GLS, %	**-33 ± 11.4 %**	**-27 ± 6.0 %**	**0.01**
FAC, %	**55 ± 9.6%**	**46 ± 9.1%**	**<0.001**

Table1. CMR characteristics (mean ±SD)

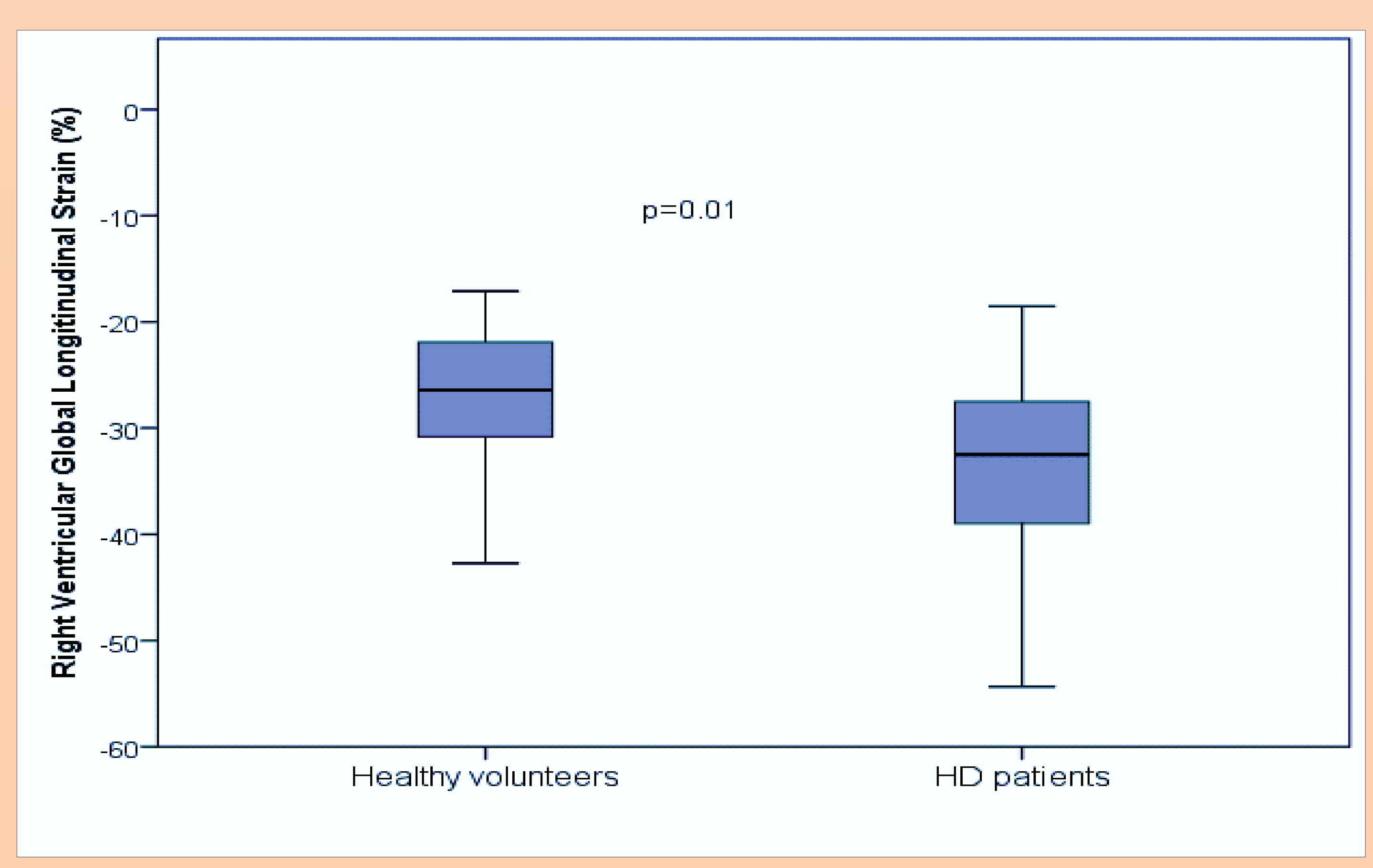

Figure 2. Box plots of RV GLS in HD patients and HV

Conclusions

HD patients demonstrated RV hypertrophy compared to HV. In contrast to LV function, where GLS has previously been reported as reduced, **RV functional parameters consistently demonstrated features in keeping with hyperdynamic RV performance compared to HV**. The significance of this finding is unknown but may represent the Starling response of an increase in cardiac output in response to right ventricular volume overload, in the setting of HD. Further research on the prognostic significance of RV function in HD patients is needed.

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