Safety and feasibility of dobutamine stress cardiac magnetic resonance for cardiovascular assessment prior to renal transplantation

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INTRODUCTION

Coronary artery disease (CAD) is reported to be 20 times higher in those on dialysis than in age matched patients with normal renal function. Kidney transplantation is considered the best treatment for patients with end stage renal failure (ESRF) for both length and quality of life. Current guidelines recommend cardiovascular risk assessment prior to transplantation. There is currently no evidence for the role of dobutamine stress cardiac magnetic resonance (DSCMR) imaging in this population, despite established evidence base in the non-chronic kidney disease (CKD) population.The aim of this study was to determine the feasibility and safety of DSCMR imaging in the risk stratification of ESRF patients awaiting renal transplantation.

METHODS

Consecutive CKD patients (n=41) who were deemed high risk for CAD were referred for clinical risk stratification prior to renal transplantation underwent DSCMR.

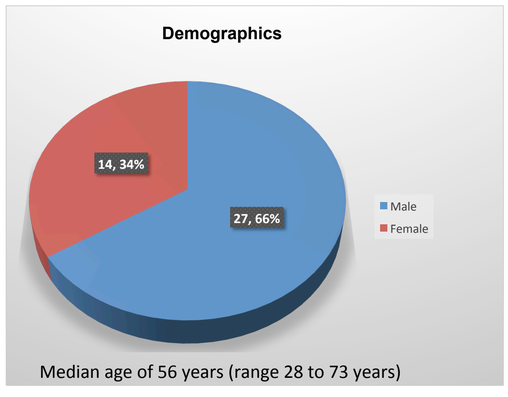
Patients were examined using a clinical 1.5T MRI. SSFP cine images were acquired in the short axis stack covering the whole of the left ventricle. Further SSFP cine images were then taken at rest and during a standardised high dose dobutamine-atropine protocol in the horizontal long axis (HLA), vertical long axis (VLA), 3 chamber views and 3 short axis views. These were repeated at each stage of inotropic stimulation. Dobutamine was infused during 3 minute stages of incremental doses of 5, 10, 20 and 40µg/kg/min until at least 85% of the maximum age predicted heart rate (220-age) was achieved.

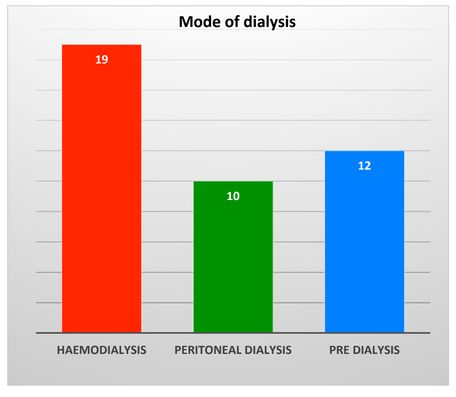
Parameters	Data
Dobutamine Stress	
Dobutamine dose, $\mu g.kg^{-1}.min^{-1}$	39.5 ± 3
Atropine dose, mg	0.53 ± 0.70
Baseline Data	
Indexed LV end diastolic volume, ml/m^2	81 ± 27
Indexed LV end systolic volume, ml/m^2	30 ± 17
LV Ejection Fraction, %	64 ± 8
Baseline Haemodynamics	
Mean BP, mmHg	156±20 / 83±14
Mean HR, $1.min^{-1}$	72 ± 12
Mean HR-SBP product, $mmHg.min^{-1}$	11177 ± 2172
Stress Haemodynamics	
Mean Systolic BP, mmHg	163±37 / 84±19
Mean HR, $1.min^{-1}$	138 ± 15
Mean HR-SBP product, $mmHg.min^{-1}$	22417 ± 5664

Table 1 - Dobutamine Stress Cardiovascular MRI volumes and haemodynamic data

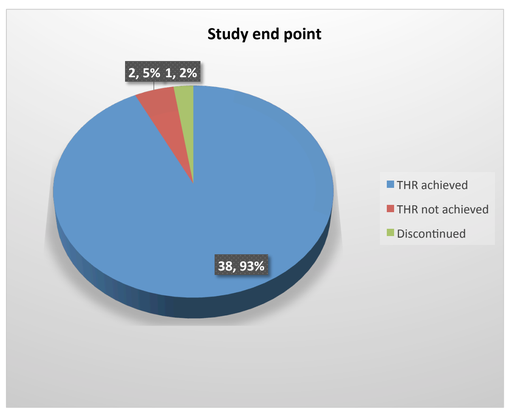
RESULTS

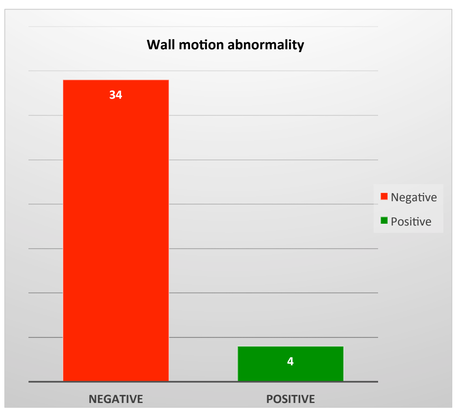
Baseline Characteristics





Main cause of the renal failure was due to diabetes mellitus (29%), hypertension (22%) and glomerulonephritis (22%).





Of the 41 patients 38 (93%) achieved the end point, being either positive for ischaemia or negative with achieving ≥ 85% of age predicted heart rate. 2 did not achieve target heart rate despite maximum dose of dobutamine and atropine and one was discontinued due to severe headache. Of the 38 which achieved an end point, 34 (90%) were negative for inducible wall motion abnormalities and 4 (10%) were positive.

Safety Issues

One patient (2%) developed severe headache resulting in termination of the scan which resolved immediately. All other patients tolerated and completed the scan. There were no occurrences of myocardial infarction, sustained ventricular arrhythmia or any serious lasting complication.

CONCLUSIONS

DSCMR is safe and viable investigation for the cardiovascular risk stratification of high-risk CKD patients prior to renal transplantation. DSCMR already has an established evidence base in the non-CKD population with superiority over other non-invasive techniques. Larger studies with outcome data are now required to define its true utility in the CKD population.

SK,DPR,DS and OEG were granted fellowships by the Gawthorn Cardiac Charitable Trust