choice for longitudinal studies in defining the natural history of uremic cardiomyopathy after renal transplantation.

Values are expressed as mean±SD or median (interquartile range). P Value <0.05 demonstrates significance in change of variable following transplantation.

11 CPEX TESTING DETECTS SUBCLINICAL CARDIAC LIMITATION TO EXERCISE IN EARLY STAGE CKD

Manvir Kaur Hayer*, Anna Price, Shanat Baig, Boyang Liu, Charles Ferro, Jonathan Townsend, Nicola Edwards, Richard P Steeds. *Queen Elizabeth Hospital Birmingham*

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Introduction Effort tolerance is impaired in end stage kidney disease. Peak oxygen uptake ($\text{VO}_{2\text{peak}}$) has been shown to be a powerful predictor of survival in haemodialysis patients. A low $\text{VO}_{2\text{peak}}$ and percent predicted VO_2 at the anaerobic threshold ($\text{VO}_2 \text{ AT}$) have also been associated with excess mortality in patients undergoing kidney transplantation. Data on effort tolerance and cardiovascular disease in early chronic kidney disease (CKD) are very sparse though it is well recognised that cardiovascular mortality begins to increase at a glomerular filtration rate (eGFR) of about 75ml/min/m^2 .

Methods This study examined effort tolerance, cardiac structure and function in 60 patients with CKD (stages 2 to 5) without known cardiovascular disease or diabetes. All patients underwent a cardiopulmonary exercise bicycle test using an individualised ramp protocol. Myocardial ischaemia was excluded by exercise stress echocardiography or 99m technetium tetrofosmin single photon electron computed tomography. Lung disease was excluded by formal lung function testing. Cardiac magnetic resonance imaging without gadolinium contrast was used to assess cardiac function and structure. The Kruskal Wallis test was used to compare the difference in mean values across stages of CKD. Correlation coefficients were measured to look for trends between continuous variables.

Results Table 1 shows the baseline characteristics per CKD stage. Percent predicted peak VO_2 was negatively associated with eGFR ($r=-0.358$, $p=0.007$) even after correction for age and haemoglobin ($p=0.005$). NT pro-BNP was negatively associated with eGFR ($r=-0.586$, $p=0.001$), even after similar correction ($p<0.001$). The percent predicted VO_2 at the anaerobic threshold was also negatively associated with worsening eGFR ($r=0.282$, $p=0.039$). Exercise capacity ($\text{VO}_2 \text{ AT}$) was negatively associated with increasing LV mass ($r=-0.382$, $p=0.006$) but there was no significant association with left ventricular (LV) size, ejection fraction or global longitudinal strain.

Discussion and implications Effort tolerance falls from the earliest stages of CKD in association with a progressive increase in LV mass and NT pro-BNP. This is the first study to examine exercise capacity in patients with early stage CKD in whom coronary artery disease has been excluded, and further study is needed to confirm whether the reduction in exercise capacity is a reflection of diastolic impairment and myocardial fibrosis that characterise end-stage kidney disease.

Abstract 11 Table 1 Baseline demographics across each stage of CKD

	CKD stage 2 n=14	CKD Stage 3 n=17	CKD Stage 4 n=9	CKD Stage 5 n=21	P Value
Age (years)	59 (45–67)	65 (54–67)	57 (53–69)	46 (33–58)	0.14
Male	8 (57%)	10 (59%)	6 (67%)	11 (55%)	0.912
Hg (g/L)	134±38	135±11	130±15	107±47	0.003
NT-pro BNP	68±70	156±152	189±115	631±651	0.001
EF (%)	71±7	70±6	68±10	69±9	0.913
LVMi (g/m ²)	62±13	60±15	62±9	84±38	0.01
% Predicted VO_2 at Peak	84 (77–109)	86 (82–94)	80 (73–88)	73 (62–91)	0.019
% Predicted VO_2 at AT	55 (42–69)	61 (55–66)	49 (41–56)	46 (39–60)	0.023
RER	1.19±0.05	1.17±0.11	1.18±0.08	1.18±0.12	0.915
Resting global longitudinal strain (%)	−18.8±2.1	−18.0±2.4	−17.9±1.9	−19.5±3.1	0.320

Data are presented as median and interquartile range, or mean and standard deviation. A p value of <0.05 demonstrates significance at the 95% confidence interval using the Kruskal Wallis test.

Abstract 11 Graph 1 The association between eGFR and % predicted VO_2 . Lines represent the line of best fit and 95% confidence intervals.

12 CHARACTERISATION OF CLOZAPINE REFERRALS TO A TERTIARY CARDIOLOGY UNIT

¹George Joy*, ²Mark Bolstridge, ²Eromona Whiskey, ³TA McDonagh, ⁴Sukhi Shergill, ⁵Carla Plymen. ¹King's College Hospital; ²South London and Maudsley NHS Foundation Trust; ³Cardiology Department, King's College Healthcare NHS Foundation Trust; ⁴Institute of Psychiatry, Psychology and Neuroscience, King's College London and Maudsley Hospital London; ⁵Imperial College Healthcare NHS Trust

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Introduction Clozapine is an essential tool in the psychiatric armoury: It is the most effective antipsychotic drug and is recommended standard treatment in those with refractory psychotic disorders. The potential risk of cardiac toxicity means

that it is not used as commonly as its effectiveness dictates it should be. We studied referrals to our Cardiology Unit from our linked national psychiatric unit to characterise the cardiac status in these individuals and determine outcome.

Methods Retrospective review of all adult patients on clozapine referred to our cardiology unit over 9 years. Electrocardiograms and echocardiographic data was collected as was mortality data. Students t-test, Mann-Whitney U and linear regression were used to analyse results.

Results 29 patients were seen by cardiology in the outpatient setting, all had a diagnosis of schizophrenia. Mean age 43 ± 12 years; 34% female ($n=10$; table 1). 59 others underwent diagnostic testing but were never referred for review.

Median left ventricular ejection fraction (LVEF) was 52 (IQR44%–55%), median HR 98 (IQR85–114bpm). No significant difference in age at review and LVEF, QRS duration, heart rate or QTc interval. There was no significant relationship between duration on clozapine and LVEF ($p=0.77$) at review. There was a significant difference in length of time on clozapine and QTc interval ($p=0.02$; $r=0.46$; figure 1).

Follow-up time was 4.4 years (IQR 2–6) from initial review; 3 patients died (subarachnoid haemorrhage, aortic aneurysm rupture, suicide). 14 of the surviving 26 (54%) remain on clozapine at most recent follow-up and demonstrated no significant change in the LVEF during this time ($p=0.66$).

Those with LV impairment tended to be seen earlier than those who developed tachycardia without LV impairment (4.7 vs 7.2 years; $p=0.27$). Patients in the former group were far more likely to have clozapine discontinued compared to those in the tachycardia group ($p=0.03$).

Discussion Clozapine use is associated with persistent tachycardia, myocarditis and cardiomyopathy; the latter carry significant morbidity and mortality. Despite being very effective, many will have clozapine stopped if there is evidence of

cardiac toxicity. Our experience suggests that the short-medium term outcome in these patients is acceptable with very low cardiac risk and no observable deterioration in LVEF.

Our findings support two distinct modes of cardiac toxicity. The underlying pathophysiology is not yet well defined and is likely to include patient-specific factors. Our data supports the feeling that tachycardia represents a benign process as all our patients had normal LVEF at the time of review.

Prospective studies are required in this complex group; the significance of QTc prolongation with clozapine use remains unclear and further study is warranted. We suggest that these patients should be managed in an interdisciplinary manner with close liaison between cardiologists and psychiatrists.

Abstract 12 Figure 1 QTc interval would appear to prolong in relation to time on Clozapine.

Abstract 12 Table 1 Demographics and p values.

	Cardiomyopathy group (n=11)	Tachycardia group (n=18)	Total group (n=29)	p value
Age, years (%)	41±15	44±11	43±12	0.51
Gender (female)	4 (36%)	5 (28%)	9 (31%)	-/-
Length of time on clozapine at review, median (range) years	4.9 (0.4–13)	7.2 (1.3–10)	6.6 (0.8–10)	0.51
Heart rate Median (range) bpm	83 (76–90)	103 (97–115)	98 (85–114)	0.0006*
QRS duration Median (range) ms	90 (88–98)	90 (85–95)	90 (86–95)	0.66
QTc interval Median (range) ms	431 (416–440)	441 (418–468)	434 (418–458)	0.47
LVEF Median (range)%	45 (37–50)	55 (52–55)	52 (44–55)	<0.001*
Clozapine discontinued	8 (73%)	5 (28%)	13 (45%)	0.027*

13

KEEPING UP THE BEAT: A QUALITY IMPROVEMENT PROJECT ON HEART FAILURE MONITORING & MANAGEMENT

Mahvesh Rana Javaid*, Georgina Baca, Lovesh Dyal, Rumbi Maka, Jessica Dillaway, Margaret Chineah, William Young, Javed Akhtar. *NHS*

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Introduction There have been many cases observed in our cardiology wards and non-cardiology wards where heart failure patients are not having optimum fluid management and up-titrating therapy. One case led a patient to have prolonged hospital stay and outcome was death. Therefore, this project is important to raise awareness.

Currently, we only have a basic daily weight chart, which the nurses record the patients weight every morning. The heart failure medications are separately found on the drug chart, and bloods are found on Cyberlab. Plus the heart