

Cardiovascular Determinants of Physical Function in Patients with ESRD on Haemodialysis

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Objectives: Patients with end-stage renal disease (ESRD) are amongst the most sedentary of all patient groups. Physical function has been shown to predict mortality in this patient group, but the relationship between measures of physical function and prognostically-relevant aspects of CV disease has not been fully explored. This could offer insight into whether exercise interventions could target specific elements of CV disease seen in these patients.

Methods: 130 haemodialysis patients, recruited as part of the CYCLE-HD trial, underwent comprehensive cardiovascular phenotyping with cardiac MRI and cardiac biomarker assessment. Subjects completed field tests of physical performance and capacity including; the incremental shuttle walk test (ISWT), sit-to-stand 60 (STS60) and the short physical performance battery (SPPB). Univariate and multivariate regression analyses were performed to identify the cardiovascular determinants of each measure of physical functioning. Pre-specified prognostically relevant measures cardiovascular disease (high-sensitivity troponin I (hsTnI), NT-proBNP, LV mass index, LV ejection fraction, LV mass:volume ratio, global native T1, pulse wave velocity (PWV), and global longitudinal strain) and variables known to influence physical performance (age, body mass index, gender, diabetes) were included in multivariable regression models to identify the independent cardiovascular determinants of physical function.

Results: Between 113-117 participants completed each field test. Mean age was 57 years (± 15), 73% were male and median dialysis vintage was 1.3 years (0.5, 3.4). On univariate correlation, age and diabetes were associated with all three physical performance tests ($p < 0.01$). Additional significant associations with the ISWT and STS60 were hsTnI, PWV and native T1. NT-proBNP also correlated with the ISWT. In multivariate models, age and diabetes were determinants of all measures of physical performance. Global native T1 was the only CV determinant to independently predict performance, and only in the ISWT. Multivariate regression models are shown in Tables 1, 2 and 3.

Conclusion: In patients on haemodialysis, native T1 was an independent determinant of ISWT performance, a measure of aerobic capacity. Age and diabetes were the overwhelming determinants in all physical function tests. These findings underscore the consequences of diabetes on metabolic ageing and physical deconditioning. Improving strategies for prevention and management of diabetes may ameliorate the 'deconditioning spiral' in these patients. Whether interventions improving physical performance translate into improvements in prognostically relevant measures of CV disease requires further study.