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1.3: IMPACT OF RENAL TRANSPLANTATION ON ARTERIAL STIFFNESS

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Oral Presentation Abstracts

1.1

ARTERIAL STIFFNESS IS RELATED TO RENAL FUNCTION IN THE GENERAL POPULATION

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Introduction: Aortic stiffness is related to renal function in patients with chronic kidney disease and may contribute to the high cardiovascular mortality in this group. However, the relationship between renal function and arterial haemodynamics in the general population has not previously been reported.

Methods: We analysed the relationship between renal function defined by estimated GFR (eGFR) and aortic pulse wave velocity (aPWV), brachial PWV (bPWV) and radial and central wave reflections (rAlx and cAlx) for participants enrolled in the Anglo-Cardiff Collaborative Trial between 2000–2009.

Results: Measurement of eGFR was available for 4795 participants with a mean age of 48 ± 23 years, 45.5% male, BP $130 \pm 20/77 \pm 11$, mean eGFR 92.7 ± 38.8 mL/min. Estimated GFR was correlated with aPWV ($\rho = -0.53^*$), bPWV ($\rho = -0.28^*$), rAlx ($\rho = -0.20^*$) and cAlx (-0.25^*) (all $P < 0.001$). In multivariate analysis, using a stepwise model including age, mean BP, gender, heart rate, glucose, cholesterol, body mass index and smoking, eGFR remained an independent determinant of aPWV ($R^2 = 0.68$, $P < 0.001$), rAlx ($R^2 = 0.72$, $P < 0.001$) and cAlx ($R^2 = 0.72$, $P < 0.001$) but not bPWV. After exclusion of people with previous CHD, CVA or diabetes ($n = 4247$), eGFR remained an independent predictor of rAlx and cAlx but not of aPWV.

Conclusion: In the largest analysis of the general population to date, eGFR is independently associated with aortic stiffness and augmentation index but explains little of the variance compared with established determinants. For aortic stiffness, but not wave reflections, this relationship is explained by the coexistence of impaired renal function and vascular disease.

1.2

VASCULAR CALCIFICATIONS AFTER CHRONIC USE OF VITAMIN-K ANTAGONISTS

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Background: Arterial calcification is commonly observed in cardiovascular disease and is associated with increased arterial stiffness, systolic hypertension and adverse cardiovascular outcome. Arterial calcification is an actively regulated process with several stimulating and inhibiting factors. An important inhibitor of arterial calcification is the Vitamin K-dependent Matrix Gla Protein (MGP). In animal studies, inhibition of Vitamin K by warfarin-treatment was associated with increased arterial calcification. We investigated in this pilot-study whether this effect of Vitamin-K antagonists could also be observed in humans.

Methods: From five different thrombosis services in the Netherlands, we recruited 19 patients that have used oral vitamin-K antagonists for more than 10 years due to an history of cardiac valvule replacement or venous

thrombo-embolic event. We also recruited 17 control-subjects. We excluded subjects older than 55 years or subjects with a history of diabetes, hyperhomocysteinemia, hyperlipidemia and previous cardiovascular events. To detect arterial calcification, anterior soft-tissue radiographs from the femoral arteries were obtained in all subjects. In addition, the carotid Intima Media Thickness (cIMT) and carotid-femoral Pulse-wave Velocity (PWV) were measured.

Results and conclusion: Femoral radiographs of sufficient quality were obtained for 18 patients and 16 controls. Fourteen (77.8%) patients on vitamin-K antagonists versus 4 (25%) control subjects had femoral artery calcifications (Odds-ratio 10.5; 95%-CI 2.15 – 51.28). Patients had a slightly higher mean cIMT (0.61 ± 0.09 mm) than control subjects (0.56 ± 0.07 mm; $p = 0.04$). There was no difference in carotid-femoral PWV between the groups. Chronic use of Vitamin-K antagonists is associated with increased arterial calcification.

1.3

IMPACT OF RENAL TRANSPLANTATION ON ARTERIAL STIFFNESS

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Introduction: Risk of a cardiovascular event is known to increase in the period immediately post-transplantation before returning to baseline or lower. We hypothesised that this might be due to changes in arterial stiffness and/or endothelial function.

Methods: We measured aortic pulse wave velocity (aPWV), wave reflections (Alx), and endothelial function in 40 patients undergoing living donor renal transplantation, immediately pre-transplant and at 1 week, 3 and 12 months post-transplant.

Results: 35 patients completed the 12 months follow-up. Mean eGFR increased from 8 ± 3 mL/min pre-transplant to 51 ± 13 mL/min at 1 week post-transplant ($P < 0.001$) and remained at this level throughout follow-up. aPWV increased from 7.4 ± 1.4 m/s at baseline to 8.1 ± 1.3 m/s at 1 week post-transplant ($P < 0.05$), but returned to baseline levels after 12 months. A similar trend in mean pressure was observed. Alx was unchanged over the 12 months. Brachial flow mediated dilatation (FMD) was unchanged at 1 week post-transplant but had improved slightly, though significantly at 1 year ($4.73 \pm 3.76\%$ vs. $6.72 \pm 3.22\%$, $P < 0.05$). The response to GTN was not altered. In a subset of patients who had plasmapheresis pre and post-transplant, Alx was significantly increased from baseline after 1 year ($8.4 \pm 11.4\%$ vs. $26.3 \pm 11.4\%$, $P < 0.03$). Brachial response to GTN was also significantly improved ($2.0 \pm 1.8\%$ vs. $9.2 \pm 4.1\%$, $P = 0.009$), although FMD was unchanged.

Conclusion: Arterial stiffness is increased at 1 week post-transplant and returns to baseline by one year reflecting the known changes in cardiovascular risk. Endothelial function appears to improve in the longer term. Therapeutic strategies targeted at minimising arterial dysfunction around the time of transplantation may improve outcomes.

1.4

INCREASED AORTIC STIFFNESS IN YOUNG SUBJECTS WITH MIGRAINE

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