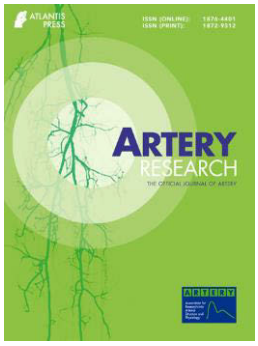

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P.069: OSTEOPOROSIS IS ASSOCIATED WITH INCREASED AORTIC PULSE WAVE VELOCITY

B. McDonnell, A. So, C. Bolton, M. Munnery, S. Williams, Yasmin, K. Poole, W.D. Evans, C.M. McEniery, I.B. Wilkinson, J.R. Cockcroft

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P.066
PERIPHERAL VASCULAR DISEASE IS ASSOCIATED WITH INCREASED AORTIC STIFFNESS

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Objective: Aortic pulse wave velocity (aPWV) is a powerful and independent predictor of all cause cardiovascular mortality. Patients with peripheral vascular disease (PVD) are at a higher risk of cardiovascular events. We hypothesized that patients with PVD would have a higher aPWV than age-matched healthy controls, and that aPWV would be inversely related to ankle brachial pressure index (APBI).
Methods: We studied 212 patients with PVD (mean age 71 ± 9 years, 68% male) with a mean ABPI of 0.64 ± 0.16 and 455 age-matched controls (mean age 70 ± 7 years, 64% male). Aortic augmentation index (AIx) augmentation pressure (AP) and central blood pressure were determined by pulse wave analysis using the SphygmoCor® system. PWV was derived using sequential carotid to femoral waveform recordings for aPWV and carotid and radial waveforms for brachial PWV.
Results: aPWV was significantly higher in patients with PVD compared with age-matched controls. (11.7 ± 3.5 vs. 9.9 ± 2.6m/s, $P<0.0001$). Both peripheral and central, systolic and pulse pressures were significantly higher in the PVD group compared to age-matched controls. AP was higher in the PVD group (19 ± 10 vs. 14 ± 7mmHg) but AIx was not. The difference in aPWV persisted after correction for mean arterial pressure (10.57 ± r 2.31vs. 9.02 ± r 3.46, $P<0.0001$). In regression model, age, mean pressure, diabetes and previous myocardial infarction predicted aPWV($r=0.6$, $p<0.001$). aPWV was inversely associated with ABPI ($R^2=$ -0.19, $P<0.0001$).
Conclusions: The increased aortic stiffness provides a possible explanation for the increased cardiovascular events seen in PVD patients but exact mechanisms underlying this need to be addressed.

P.067
EFFECTS OF INHIBITION OF AUTONOMIC NERVOUS SYSTEM ON AORTIC STIFFNESS FOLLOWING SYSTEMIC INFUSION OF GLYCERYL TRINITRATE IN HEALTHY VOLUNTEERS

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Objective: Nitric oxide (NO) contributes to smooth muscle tone relaxation, however, in humans the role of smooth muscle tone and NO in regulating aortic stiffness is controversial. We hypothesised that the nitric oxide donor GTN would reduce aortic PWV in vivo, but this effect would be partly attenuated by reflex activation of the sympathetic nervous system. The aim of this study was to investigate whether the autonomic nervous system (ANS) masked any effect of NO on aortic stiffness.
Methods: 10 healthy subjects; mean age, 28 ± 6 years were studied on two visits, in a double-blinded, placebo controlled 2-way crossover design. On both visits, subjects were randomly selected to have either a bolus administration of pentolinium (ganglion blocker) or placebo followed by an infusion of GTN or placebo. The opposite arm was of the study was then carried out following a 60 minute break.

Heart rate variability, blood pressure, cardiac haemodynamics, brachial and aortic pulse wave velocity (PWV) were measured at regular intervals throughout the study.
Results: The main findings from this study were that incremental doses of GTN led to a significant 9% fall in brachial PWV ($P<0.0001$), with no effect on aortic PWV. Despite blockade of the ANS, aPWV remained unaffected by incremental doses of GTN.
Conclusions: The major findings were that despite blockade of the both the parasympathetic and sympathetic nervous system, subsequent systemic infusion of GTN had null effect on aortic pulse wave velocity suggesting that there are other mechanisms involved in the regulation of aortic stiffness.

P.068
A NON-INVASIVE APPROACH TO QUANTIFY VENTRICULAR-ARTERIAL INTERACTION: COMPARING VASCULAR TYPE EHLERS-DANLOS SYNDROME PATIENTS AND NORMAL INDIVIDUALS

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Introduction: We hypothesized that the pressure rate ratio (PRR), defined as the arterial upstroke dP/dt normalized by isovolumic ventricular dP/dt, is less sensitive to inter-subject variance and therefore better in identifying individuals with abnormal ventricular-arterial function than single hemodynamic parameters.
Methods: We studied the characteristics of PRR in 21 normals (age-range 19-32 yrs) and 7 age-matched vascular type (IV) Ehlers-Danlos syndrome (EDS) patients. ECG, brachial pressure and right common carotid artery (CCA) diameter waveforms (M-mode ultrasound) were obtained in supine position. LV systolic time intervals, i.e. isovolumic-contraction (ICP) and ejection periods (EP), were extracted from diameter waveforms using a previously described algorithm. We calculated diastolic blood pressure-to-ICP ratio (DBP/ICP), ICP/EP, CCA-distension (ΔD), diastolic diameter (Dd), maximum diameter velocity (dD/dt,max), and distensibility (DC) and compliance (CC) coefficients. PRR was defined as 100%(K·dD/dt,max)/(DBP/ICP), with K=(mean blood pressure − DBP)/(mean diameter − Dd). Results are given as mean±SD.
Results: EDS subjects had higher heart rate (+9bpm, $p=0.045$), but lower ΔD (0.62 ± 0.11 vs 0.74 ± 0.15mm, $p=0.027$) and DC (33 ± 8 vs 41 ± 9/MPa, $p=0.055$). All other variables, including PRR (26 ± 7 vs 27 ± 6%), were not significantly different between groups, reflecting similar ventricular-arterial interaction. With both groups pooled, two individuals presented with elevated PRR (40%). In a normal subject (age 20 yrs) this was associated with abnormally low sympathetic activity. The other subject (EDS, age 24 yrs) exhibited increased sympathetic activity and decreased DC (20/MPa), shorter EP (−10%) and depressed LV function.
Conclusions: Our findings suggest that PRR enables identification of individuals with abnormal ventricular-arterial function in a heterogeneous population.

P.069
OSTEOPOROSIS IS ASSOCIATED WITH INCREASED AORTIC PULSE WAVE VELOCITY

B. McDonnell [1], A. So [2], C. Bolton [4], M. Munnery [1], S. Williams [1], Yasmin [2], K. Poole [3], W.D. Evans [1], C.M. McEniery [1], I.B. Wilkinson [2], J.R. Cockcroft [1]. [1]*Cardiology Department, Wales Heart Research Institute, Cardiff University, Cardiff, United Kingdom,* [2]*Clinical Pharmacology, Vascular Research Clinic, Addenbrooke's Hospital, Cambridge, United Kingdom,* [3]*Department of Medicine, Addenbrooke's Hospital, Cambridge, United Kingdom,* [4]*Department of Respiratory Medicine, Cardiff University, Llandough Hospital, Cardiff, United Kingdom*

Objective: Arterial stiffening and osteoporosis both occur predominantly in late life. Osteoporosis has been associated with increased peripheral pulse pressure and arterial stiffness, but its effect on aortic pulse wave velocity (aPWV) is unclear. The aim of this study was to examine the relationship between arterial calcification and aPWV in healthy subjects and a cohort of patients with osteoporosis.
Methods: aPWV and bone mineral density (BMD) were measured non-invasively in 42 patients with osteoporosis and 120 healthy volunteers. Subjects with cardiovascular disease, renal disease or hypertension were excluded. aPWV was assessed using the SphygmoCor system, and vertebral / hip BMD from thoraco-lumbar CT images, using Mindways software.
Results: The mean±SD aPWV was significantly higher in patients with osteoporosis than controls (9.6 ± 2.9 vs 8.2 ± 1.7 m/s; $P = 0.01$). Brachial PWV and augmentation index did not differ. Although mean arterial pressure did not differ between the groups, peripheral and central pulse pressures were significantly higher in the osteoporotics (by 6 ± 2 and 5 ± 2 mmHg respectively; $P > 0.01$ for both). In pooled data for osteoporosis patients and controls, aortic PWV correlated inversely correlated with T-score ($r = -0.27$, $P = 0.001$).
Conclusion: Patients with osteoporosis have increased aortic stiffness compared with healthy volunteers, independent of their mean arterial pressure. We speculate that arterial calcification may be involved in the development of arterial stiffness and osteoporosis.

P.070
ARTERIAL STIFFNESS ALTERATIONS DURING HEMODIALYSIS

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