

MEETING ABSTRACTS

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1.01

MICROVASC Study—Assessing Early Vascular Aging and Feasibility of Measuring Arterial Stiffness Via Pulse Wave Velocity During a Parabolic Flight Campaign

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Background: Pulse wave velocity (PWV) could be accelerated by spaceflight, mimicking 10–20 years of cardiovascular aging on Earth. The main objective of the MICROVASC study was to assess the feasibility of measuring PWV in microgravity conditions during a parabolic flight, using the pOpmètre® device (Axelife, France). The secondary objectives were to investigate how microgravity affects PWV, BP, and HR.

Methods: Three men and four women (42 ± 13 years) were included. PWV was measured using two photoplethysmography sensors attached to the right finger and toe, and the finger-to-toe pulse wave arrival time was computed. BP was recorded at the left calf using an Omron sphygmomanometer. Data were collected pre-, post- and in-flight at 1G, 0G, and 1.8G. More than 20 measurements per volunteer were done. Repeated measure ANOVA was performed.

Results: PWV measurements in microgravity were feasible, with 93.65% of valid measurements in 0G, 85.05% in 1G, and 68.42% in 1.8G. When compared to baseline (5.92 ± 0.9 m/s), PWV increased in-flight 1G (6.22 ± 1.38 m/s, $p=0.00927$) and 1.8G (6.66 ± 1.71 m/s, $p=0.00012$). Systolic BP decreased between 1 and 0G (from 136 ± 14.6 to 134 ± 16.9 mmHg, $p=0.0276$), while both systolic and diastolic BP were significantly decreased post-flight vs. baseline (138 ± 14.9 to 130 ± 15.4 mmHg, $p=0.022$, 65 ± 7.24 to 59 ± 6.44 mmHg, $p=0.0015$, respectively). HR showed no significant changes across in-flight conditions.

Conclusion: PWV measurements using pOpmètre® are feasible in microgravity, measurement failures were mainly due to excessive body motion artifacts during the dynamic phases of the parabolic flight. Observed PWV changes were pressure independent, and likely stress dependent.

1.02

A Comparison Between Constitutive and Non-constitutive Wall Models in Capturing Pressure–Diameter Relationships Along the Aortic Length

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Background: The arterial wall is an anisotropic, hyperelastic fibrous tissue subjected to biaxial loading. While constitutive models accurately capture its mechanical behaviour by accounting for individual wall constituents, simplified non-constitutive formulations are often preferred in one-dimensional haemodynamic simulations for computational efficiency. We aim to 1) evaluate non-constitutive arterial wall models' capability to capture human aortic mechanical behaviours and 2) quantify parameter changes across aortic regions.

Methods: We used the four-fibre family model to generate pressure–diameter curves of the descending thoracic, supraceliac, infrarenal, and distal abdominal aorta of $N=10$ donors (age 62 ± 11 years, 30% females) [1] by simulating pressurisation at fixed in vivo-like axial stretch [2]. We then fitted the parameters of linear [3] and Langewouters pressure–diameter models [4] to these synthetic data.

Results: The Langewouters model more accurately captured the simulated aortic pressure–diameter relationships than the linear model ($R^2=0.999\pm 0.001$ vs. 0.863 ± 0.101 , Figure A). The linear model's stiffness parameter E did not vary significantly with location. Conversely, two out of three Langewouters parameters ($P0$: maximum compliance pressure, Am : area-like parameter) dropped significantly along the aorta while $P1$ (half-width pressure) did not vary significantly (Figure B–E).

Conclusion: The Langewouters model offers a better fit to the constitutive-based pressure–diameter curves, and its parameters show enhanced location sensitivity compared to the linear model, which is likely due to its ability of accurately recapitulating the complex non-linear behaviour of the human aorta.



Methods: We developed a novel approach where patients, guided by an experienced nurse, measure their blood pressure 2 h after taking antihypertensive medications, with 3 measurements, 1 min apart, over 3 consecutive days. The nurse also performs medication reconciliation and is authorized to adjust the dose of antihypertensive medications as needed. The goal is to individualize treatment and achieve a blood pressure target of $\leq 125/75$ mmHg.

Results: A total of 903 individuals were invited to perform HBPM. Of these, 255 have already completed HBPM and achieved the target blood pressure, while 480 are still undergoing measurements. Unfortunately, 164 individuals were noncompliant, and 4 patients were followed by office BPM instead of HBPM. In 4 cases, HBPM was complemented with 24-h ambulatory BPM to assess whether our strategy accurately reflects blood pressure variation and informs treatment decisions.

Conclusion: HBPM is a simple and effective tool for mitigating CV risk in patients with CKD. Regular patient-nurse contact significantly improves medication compliance. We're currently educating primary care clinics on using a similar approach for early CKD prevention.

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Prevalence of Untreated Hypertension and Its Correlation with Cardiovascular Risk Factors in Middle-Aged Lithuanian Adults, from 2009–2022

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Background: This study characterises the prevalence of untreated hypertension among middle-aged Lithuanian adults and compares cardiometabolic risk profiles between untreated hypertensive and normotensive individuals.

Methods: We conducted a retrospective analysis of nationally representative data from 120,955 healthy adults (men 40–54, women 50–64 years) participating in the Lithuanian High Cardiovascular Risk (LitHiR) primary prevention programme between 2009 and 2022. Cardiovascular risk factors were compared between normotensive and untreated hypertension groups by sex.

Results: Untreated hypertension prevalence showed year-to-year variation with consistently higher rates in men. Both sexes demonstrated significantly worse cardiovascular risk profiles in the untreated hypertension versus normotensive groups: metabolic syndrome prevalence was approximately doubled (women: 56.8% vs 28.1%, men: 52.0% vs 24.9%), with significantly higher rates of abdominal obesity (women: 55.4% vs 33.4%, men: 37.8% vs 18.3%), BMI-based obesity (women: 43.2% vs 22.51%, men: 36.78% vs 18.37%), diabetes mellitus (women: 12.3% vs 5.5%, men: 12.2% vs 6.2%), and elevated triglycerides (women: 29.1% vs 19.3%, men: 41.1% vs 29.8%). Untreated hypertensive individuals showed poorer lifestyle behaviors including reduced physical activity and healthy diet adherence, with higher current smoking rates in men (43.3% vs 38.3%). All differences were statistically significant ($p < 0.05$).

Conclusion: Untreated hypertension is associated with substantially worse cardiometabolic risk profiles and lifestyle behaviors. This condition affects a considerable number of Lithuanian middle-aged adults, potentially accelerating vascular ageing during critical middle-aged years.

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Undiagnosed and Untreated Hypertension in Lithuanian Men Aged 40–54 years: Prevalence and Cardiometabolic Risk Profile

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Background: Hypertension is a major determinant of arterial dysfunction and accelerated vascular ageing yet remains frequently

undetected in middle-aged populations. We aimed to determine the prevalence of undiagnosed and diagnosed untreated hypertension in middle-aged Lithuanian men, and to assess the cardiometabolic risk factors associated with these conditions.

Methods: This cross-sectional study analysed retrospective data from 52,012 male participants aged 40–54 years who took part in the Lithuanian High Cardiovascular Risk Primary Prevention Programme between 2009 and 2019. Risk factor prevalence—including dyslipidaemia, diabetes mellitus, obesity (measured by body-mass index (BMI) and waist circumference), metabolic syndrome, smoking, family history of cardiovascular disease, and related biochemical markers—was compared across three groups: normotensive, those with undiagnosed hypertension, and those diagnosed but receiving no treatment.

Results: The prevalence of undiagnosed and diagnosed untreated hypertensive increased modestly between 2009 and 2019. Overall, 26.84% of middle-aged hypertensive men remained undiagnosed, and 18.57% of those diagnosed received no antihypertensive treatment. Both undiagnosed and diagnosed untreated hypertensive groups had higher rates of all assessed risk factors compared with normotensive individuals, with dyslipidaemia being most common (91.20% and 93.40% respectively). Cardiometabolic parameters were markedly elevated in these groups. BMI, waist circumference, fasting glucose, and total cholesterol were independently linked to both undiagnosed and untreated hypertension.

Conclusions: A substantial proportion of middle-aged Lithuanian men with hypertension experience considerable delays before receiving appropriate pharmacological treatment. The study's findings highlight distinct health profile differences among men categorised by their hypertension status.

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Psychosocial and Behavioral Modulators of Vascular Dysfunction in People Living with HIV: A Cross-Sectional Study

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Background: Cardiovascular disease (CVD) is a leading cause of mortality in people living with HIV (PWH). In addition to traditional risk factors, a high burden of comorbidities—including mental health disorders, substance use, and sleep disturbances—may contribute to elevated CVD risk. We evaluated associations between these comorbidities and vascular health in PWH.

Methods: We enrolled PWH aged >40 years on stable antiretroviral therapy, with suppressed viral load and no CVD history. Endothelial function was assessed using flow-mediated dilation (FMD), arterial stiffness by pulse wave velocity (PWV), and blood pressure via standardized measurement. Mental health, substance use, and sleep disturbances were evaluated using validated questionnaires. Multivariable linear and logistic models assessed correlates of vascular dysfunction and hypertension.

Results: Among 118 PWH, 54.6% were female at birth, 83.9% identified as Black, and 55.5% had a high school education or less. Substance use was reported by 37.5%, sleep disturbances by 7.1%, and mental health disorders by 47.3%. Endothelial dysfunction was present in 42%, arterial stiffness in 15%, and hypertension in 60%. In adjusted models, cocaine use was associated with lower FMD ($\beta = -1.48$; 95% CI: $-2.46, -0.54$) and higher odds of endothelial dysfunction (OR 19.3; 95% CI: 1.72, 217.74). Sleep disturbances were associated with higher PWV (β 1.6; 95% CI: 0.23, 2.97). Hallucinogen use was inversely associated with hypertension (OR 0.32; 95% CI: 0.12, 0.86).

Conclusion: Vascular alterations are highly prevalent in PWH. Cocaine use and sleep disturbances are linked to vascular