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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 ($R2 = 0.999 \pm 0.001$ 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.

P.27

Association Between A Body Shape Index and Carotid Plaque Prevalence in a Primary Prevention Cohort

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Background: A body shape index (ABSI) is an anthropometric measure that may better capture cardiovascular risk than traditional metrics. (1) The relationship between ABSI and carotid plaque is not fully understood, particularly with respect to sex differences.
Methods: This cross-sectional study used data from the Lithuanian national primary atherosclerotic cardiovascular disease prevention programme. The study included men aged 40–54 and women aged 50–64, excluding individuals with prior major cardiovascular events. After exclusions, 6,718 participants (3,886 women) were analysed. ABSI was calculated for each participant, and sex-specific quartiles were defined. Carotid plaque was assessed by Duplex Doppler ultrasonography and defined as localized wall thickening > 1.5 mm or intima-media thickness > 50% greater than adjacent segments. Prevalence of carotid plaque across ABSI quartiles was compared separately for men and women.
Results: In men, carotid plaque prevalence differed significantly across ABSI quartiles (P = 0.011). The highest prevalence was observed in the highest ABSI quartile (Q4, 50.2%), while Q2 had the lowest prevalence (41.5%). The association was non-linear, as Q1 showed a higher prevalence than Q2 (44.4% vs 41.5%). In women, no significant differences in carotid plaque prevalence were observed across ABSI quartiles (P = 0.457).
Conclusion: Higher ABSI is associated with increased carotid plaque prevalence in men, but not in women, in a Lithuanian primary prevention cohort. The non-linear association in men suggests that factors beyond ABSI may influence carotid plaque development. These findings highlight the need for sex-specific risk assessment in cardiovascular prevention strategies.
Figure:

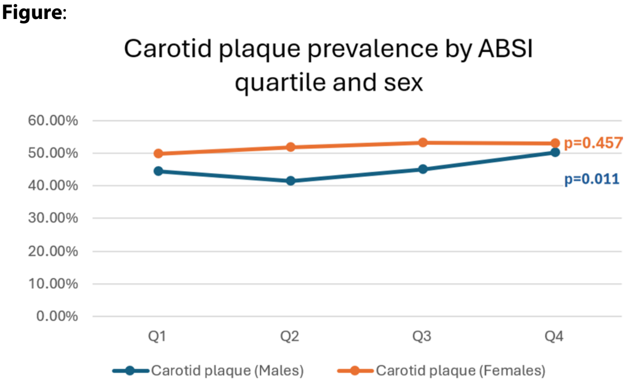

Figure 1. Carotid plaque prevalence by ABSI quartile and sex

Reference:

[1] Bertoli S, Leone A, Krakauer NY, Bedogni G, Vanzulli A, Redaelli VI, et al. Association of Body Shape Index (ABSI) with cardio-metabolic risk factors: A cross-sectional study of 6081 Caucasian adults. PLOS ONE. 2017 Sep 25;12(9):e0185013.

P.28

Cognitive Frailty and Arterial Stiffness—Findings from the FRAXI Study

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Background: Cognitive frailty, defined as the presence of physical frailty and cognitive impairment in the absence of dementia, is a common finding among older adults. The causative factors for cognitive frailty are not well understood. It is known that vascular factors such as arterial stiffness are associated with ageing and frailty. In the Frailty and arterial stiffness- role of oxidative stress and inflammation (FRAXI) study, the correlation between cognitive frailty (assessed by the mini-mental state examination (MMSE)), clinical frailty score (CFS) and arterial stiffness was explored.
Methods: The longitudinal FRAXI study included fifty community dwelling adults ≥ 70 years (mean age ± standard deviation: 79 ± 5 years, 46% male), with CFS ≤ 6 and no active malignancy, who were followed up for six months. Measures of arterial stiffness included pulse wave velocity (PWV, Complior®) and cardio ankle vascular index, measured at baseline. Other study measurements: MMSE, timed up and go test), sarcopenia, geriatric depression scale, interleukin-6 and high sensitivity C-reactive protein biomarkers were measured at baseline and 6 months.
Results: All fifty participants were assessed for cognition using MMSE, with mean CFS at baseline of 3.5 (± SD 1.4) and at follow up, 4.0 (± SD 1.5). At baseline, MMSE strongly correlated with both functional and phenotypic frailty as assessed by Charlson's Comorbidity Index (r = -0.3; p < 0.05) and CFS (r = -0.5; p < 0.001). Similarly, MMSE strongly correlated with measures of arterial stiffness; PWV-carotid femoral (r = -0.4; p = 0.01) and PWV-carotid radial (r = -0.4; p < 0.005). At follow up, MMSE remained strongly correlated with CFS (r = -0.3; p < 0.01).
Conclusion: Cognitive frailty correlates strongly with measures of vascular ageing. Arterial stiffness can be used as a vascular measure to identify older adults at risk of cognitive impairment.

P.30

Life-Course Systolic Blood Pressure Trajectories and Their determinants-Longitudinal Insights from the MRC National Survey of Health and Development

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Background: Systolic blood pressure (SBP) trajectories are mostly derived from cross-sectional studies. The MRC National Survey of Health and Development (NSHD), a British birth cohort, enables longitudinal analysis of BP changes from early midlife to older adulthood and the influence of demographic and other factors.
Methods: 473 NSHD participants (229 women; born in 1946) with ≥ 6 measurements of SBP between age 36 and 72y. SBP trajectories were modelled using mixed effects fractional polynomial regression with random intercepts and slopes, and the influence of sex, BMI, diabetes status, occupational social class, and antihypertensive treatment was examined. Data are means [95% confidence intervals].
Results: SBP increased with age, peaking at ~ 60y then declining (Figure). Age-related patterns were similar in men and women, although SBP was lower in females at all ages (-4.97 [-6.91, -3.04] mmHg). People with BMI above 30 kg/m^2 was associated with a steeper rise, 1.38 [0.87, 1.85] mmHg/year vs 1.32 [0.72, 2.00] mmHg/year, and slower fall,