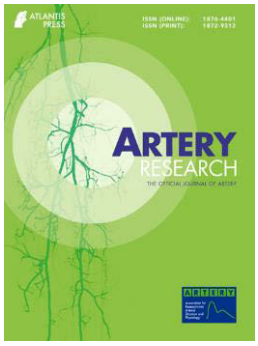

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P168: ENDOTHELIAL REGULATION OF AWV IS IMPAIRED DURING INCREASE IN BLOOD FLOW IN ESSENTIAL HYPERTENSION

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Methods: The study was conducted on 2091 participants in the Avon Longitudinal Study of Parents and Children (ALSPAC), a prospective population-based birth cohort study, aged 17. BP measurement and echocardiography was performed and heart rate (HR), stroke volume (SV) and TPR calculated. Data are means (SD).
Results: Table 1 shows selected characteristics of the sample. Higher quintiles of systolic BP were associated with higher SV, higher HR and higher TPR. However, the proportional contribution made by SV, HR and TPR to mean arterial pressure differed little by systolic BP quintile (stroke volume (32−34%) heart rate (25−29%) and TPR (39−41%)).

Variable	Males (n = 939)	Females (n = 1152)	All (n = 2091)
y	(0.3)	(0.3)	(0.3)
kg/m^2	(3.7)	(4.2)	(4.0)
mmHg	11)/64(8)	9)/65(7)	11)/65(8)
bpm	0	0	0
L/min	1.0)	0.8)	0.9)
ml	3	1	3
mmHg ml/min	(5.9)	(6.0)	(6.0)

Conclusions: Higher blood pressure is attributable to a combination of higher cardiac output (i.e. SV×HR) and higher TPR in a population-based sample of adolescents. There is no evidence of a disproportionate contribution from CO at higher BP levels.

P166
HEAD-DOWN TILT BED-REST SIGNIFICANTLY INCREASES CENTRAL ARTERIAL STIFFNESS

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The vascular system is subject to continual variation in mechanical stresses, both physiological and pathological. Vascular remodeling via changes in vessel wall properties, including thickness and stiffness, is a major feature of aging and cardiovascular disease.
A more detailed understanding of the interplay between mechanical stress, aging, CVD and vascular remodeling will aid prevention of increased cardiovascular risk following long term microgravity.
This study aims at assessing vascular remodeling processes resulting from a 60-day head-down-tilt bed-rest period during the European Space Agency Study (Toulouse, France).
We hypothesize that arterial remodeling processes are modified by long term bed- rest and constitute a significant cardiovascular risk in the long term for astronauts. Applanation tonometry is used to assess carotid to femoral pulse wave velocity (PWV) and non-invasive ultrasound imaging are used to assess arterial remodelling processes at the carotid, femoral, brachial and popliteal arteries.Measurements are performed at baseline; at day 29 and 52 of bed-rest; and at day 6 and 30 of the recovery period.
The preliminary results including 10 first subjects, demonstrate a strong effect of bed- rest on arterial PWV.The average PWV at baseline equals $7{,}6 \pm 1.4$m/s and is increased to 9.0 ± 1.9m/s after 29 days, and, 9.3 ± 1.8m/s after 52 days bed-rest. This increase is significantly different between baseline, and, 29 and 52 days bed-rest ($p < 0.005$).
Increase in PWV suggests a rapid and significant stiffening of the central arteries, which on healthy subjects corresponds to an aging process wich occurs many years. Low gravity conditions as during bed-rest induce significant arterial stiffening that could be linked to long term CVD risks for either patients in bed-rest or astronauts.

P167
PULSE PRESSURE AMPLIFICATION AND AUGMENTATION INDEX CHANGE IN OPPOSITE MANNER WITH ARTERIAL STIFFNESS INDEPENDENTLY OF SYSTEMIC RESISTANCE

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Background: Pulse Pressure Amplification (PPA) is the increase in Pulse Pressure (PP) from proximal to distal arteries. The Augmentation Index (AIx) is the secondary increase in aortic pressure in systole relative to PP. With aging and increased arterial stiffness the PPA *de*creases while the AIx *in*creases. Since both depend on the reflection of pressure waves, the finding that PPA and AIx change in opposite ways seems surprising.
Methods: Aortic PPA, AIx and Reflection Magnitude ($RM = P_{reflected}/P_{forward}$) were determined in a multibranched model and during control and Valsalva Maneuver in the human.
Results: During the Valsalva Maneuver reflections decrease: the lower mean arterial pressure results in lower stiffness and Pulse Wave Velocity (PWV) while Systemic Vascular Resistance (SVR) is increased. The model confirms that SVR plays a minimal role in terms of reflections. Reflections result from many reflections sites in the larger arteries. The lower PWV implies shorter wave length and thus artery length/wave length increases. This increase makes the differences in travel times from the many reflection sites to the heart more different resulting in lower total reflection: RM and AIx decrease. The lower PWV, thus the shorter wave length, also implies an increase in travel time over the aorta, and larger amplification. (It has been shown that local reflections change little with changes in stiffness.)
Conclusions: Reflections are mainly determined by travel times of reflected waves of the larger arteries. Mean pressure determines arterial stiffness and the stiffness change, via PWV, results in the opposite changes in RM and PPA.

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P168
ENDOTHELIAL REGULATION OF AWV IS IMPAIRED DURING INCREASE IN BLOOD FLOW IN ESSENTIAL HYPERTENSION

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Background: Arterial wall viscosity (AWV) depends on endothelium-derived factors in physiological conditions (1,2). Hypertension is characterized by an altered FMD during sustained flow increase due to endothelial dysfunction (3). Whether NO and EETs regulate change in AWV during increase in flow in hypertensive patients (HT) as compared with normotensive controls (NT) remains to be evaluated.
Methods: Radial artery diameter, wall thickness and arterial pressure were measured in 18 untreated essential HT and 14 frequency matched

NT during hand skin heating with saline, L-NMMA, fluconazole, or both inhibitors infusion. AWV was estimated by the ratio of the area of the hysteresis loop of the pressure-diameter relationship (W_V, viscous energy dissipated) to the area under the loading phase (W_E, elastic energy stored).
Results: During saline infusion, W_V, W_E and W_V/W_E were not modified after heating in NT whereas W_V/W_E increased in HT ($39.3 \pm 12.0\%$ to $49.9 \pm 7.7\%$, $p < 0.05$) due to a larger increase in W_V than W_E (ΔW_V: $+41.5 \pm 27.6\%$ vs. ΔW_E: $+25.1 \pm 28.4\%$, $p < 0.05$). With all inhibition sequences, W_V/W_E increased after heating in NT ($p < 0.05$) due to a larger increase in W_V than W_E ($p < 0.05$). In HT with fluconazole, L-NMMA and L-NMMA + fluconazole, W_V/W_E increased after heating ($p < 0.05$) due to a larger increase in W_V than W_E ($p < 0.05$), similarly to saline infusion. In all conditions, increase in shear stress was similar between NT and HT.
Conclusion: NO and EETs maintain stable AWV during change in flow in NT, and this regulation is lost in HT resulting in an increased AWV after heating.

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P170
SHORT-TERM EFFECTS OF TRANSCATHETER AORTIC VALVE IMPLANTATION ON AORTIC FUNCTION AND HEMODYNAMICS

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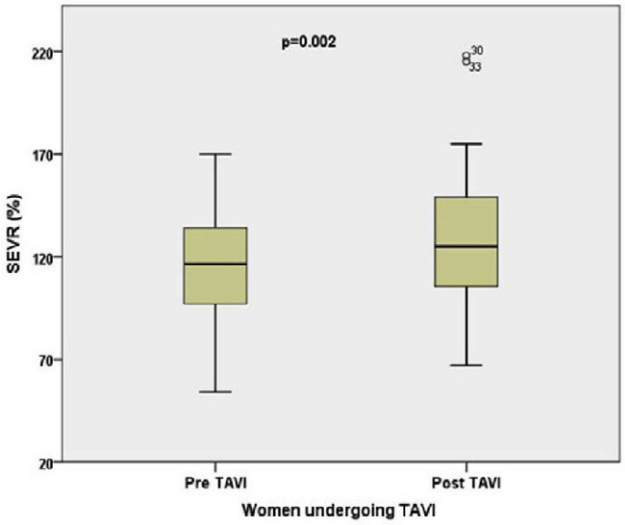
Purpose/Background/Objectives: Aortic stiffness and hemodynamics are independent predictors of adverse cardiovascular events. Transcatheter aortic valve implantation (TAVI) is growingly used in elderly patients with aortic stenosis. We sought to investigate the effect of TAVI upon aortic vascular function and hemodynamics as well as the interplay between genders.
Methods: Twenty high-risk patients (mean age 82.2 ± 5.3 years, 13 female) with severe symptomatic aortic stenosis undergoing TAVI were included. Aortic stiffness was estimated through carotid-femoral pulse wave velocity (PWV). Aortic hemodynamics (aortic pressures, aortic augmentation index [AIx]) and subendocardial viability ratio (SEVR) were measured with Sphygmocor. Measurements were conducted prior to the implantation and at discharge.
Results: PWV prior to the implantation was 8.6 ± 1.5 m/s and aortic AIx = $33.0 \pm 14.0\%$ for the overall population. There was no statistically significant change in peripheral or aortic pressures as well as on aortic stiffness after implantation of TAVI. However, there was a marginally non-significant trend for an increase in SEVR (116 ± 28 vs $131 \pm 40\%$, $p = 0.067$). Results to the male population were similar to the overall population.
Conversely, in the female population, there was a significant increase in PWV after TAVI (8.4 ± 1.2 m/s vs $8.9 \pm 1.3\%$ with $p = 0.034$, respectively). Furthermore, there was a significant increase in SEVR after TAVI (107 ± 28 vs $125 \pm 24\%$ with $p = 0.002$, respectively). All other variables did not change significantly in the female population.



Conclusion: Our study shows that shortly after TAVI female subjects experience an increase in aortic stiffness with an improvement of myocardial perfusion. These findings further elucidate the short-term hemodynamic consequences of aortic valve repair.

P171
COMPLIANCE OF EXTREMELY DILATED MAIN PULMONARY ARTERIES IN PULMONARY ARTERIAL HYPERTENSION

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Background: Main pulmonary artery (MPA) dilation is a radiological sign of pulmonary hypertension (PH) and is an independent risk factor of sudden death (Żyłkowska et al, Chest 2012). Extreme MPA dilation is a rare consequence of PH. We hypothesize that the main pulmonary artery compliance is larger and contributes more to total arterial compliance in PH patients with an extremely dilated MPA when compared to patients with a less dilated MPA.
Methods: Cardiac magnetic imaging (CMR) scans of idiopathic and hereditary pulmonary arterial hypertension (PAH) patients were retrospectively analyzed. Six PAH patients with extremely dilated MPAs ($\geq$45 mm diameter on transverse plain CMR images of the MPA) and six PAH patients with MPA diameter $<$45 mm were included. Total pulmonary arterial compliance (C_{tot}) was calculated by stroke volume (SV) over pulse pressure (PP) and MPA compliance (C_{MPA}) by (Δarea*length)/PP (length was assumed 5 cm for all MPAs). C_{MPA}/C_{tot} ratio could therefore be calculated by CMR derived flow images alone: C_{MPA}/C_{tot} = (Δarea*length)/SV.
Results: Mean age in both groups was not different, mean pulmonary artery pressure was higher in patients with an extremely dilated MPA (73 ± 9.0 mmHg) compared to patients with non-extremely dilated MPA (48 ± 5.4 mmHg, $p = 0.02$). A trend toward a higher C_{MPA}/C_{tot} ratio was observed in patients with extremely dilated MPA ($p = 0.0534$).
Conclusion: In PAH the contribution of the MPA to total compliance tends to be higher in patients with a MPA diameter $\geq$45 mm then in patients with a diameter $<$45mm.