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

Joanne Groeneveldt, Tijmen van der Wel, Tim Marcus, Frances De Man, Anton Vonk Noordegraaf, Nicolaas Westerhof, Berend Westerhof

To cite this article: Joanne Groeneveldt, Tijmen van der Wel, Tim Marcus, Frances De Man, Anton Vonk Noordegraaf, Nicolaas Westerhof, Berend Westerhof (2017) P171: COMPLIANCE OF EXTREMELY DILATED MAIN PULMONARY ARTERIES IN PULMONARY ARTERIAL HYPERTENSION, Artery Research 20:C, 84–85, DOI: https://doi.org/10.1016/j.artres.2017.10.119

To link to this article: https://doi.org/10.1016/j.artres.2017.10.119

Published online: 7 December 2019
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 (Wv, viscous energy dissipated) to the area under the loading phase (WE, elastic energy stored).

Results: During saline infusion, Wv, WE, and Wv/WE were not modified after heating in NT whereas Wv/WE increased in HT (39.3 ± 12.0% to 49.9 ± 7.7%, p = 0.05) due to a larger increase in Wv than WE (ΔWv: +41.5 ± 27.6% vs. ΔWE: +25.1 ± 28.4%, p < 0.05). With all inhibition sequences, Wv/WE increased after heating in NT (p < 0.05) due to a larger increase in Wv than WE (p < 0.05). In HT with fluconazole, L-NMMA and L-NMMA + fluconazole, Wv/WE increased after heating (p < 0.05) due to a larger increase in Wv than WE (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.

References

P170
SHORT-TERM EFFECTS OF TRANSCATHETER AORTIC VALVE IMPLANTATION ON AORTIC FUNCTION AND HEMODYNAMICS
Dimitrios Terentres-Printziou, Charalampos Vlachopoulos, Konstantinos Toutouzas, Georgios Latsios, Andreas Synetos, Georgios Trantalis, Fanis Mitropoulos, Maria Drakopoulou, Konstantinos Stathogiannis, Vicky Penepoupolou, Konstantinos Kogleras, Konstantinos Azaouridis, Manolis Vavaranakis, Dimitrios Tousoulis
Peripheral Vessels Unit, First Department of Cardiology, Hippokration Hospital, Medical School, National and Kapodistrian University of Athens, Athens, Greece

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 ± 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 ± 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 ± 1.3% with p = 0.034, respectively). Furthermore, there was a significant increase in SEVR after TAVI (107 ± 28 vs 125 ± 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
Joanne Groeneveldt 1, Timmen van der Wel 1, Tim Marcus 1, Frances De Man 1, Anton Vond Noordergraaf 1, Nicolaas Westerhof 1, Berend Westerhof 1, 2
1Department of Pulmonary Diseases, VU University Medical Center, Amsterdam, The Netherlands
2Department of Medical Biology, Section Systems Physiology, Laboratory for Clinical Cardiovascular Physiology, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands

Background: Main pulmonary artery (MPA) dilation is a radiological sign of pulmonary hypertension (PH) and is an independent risk factor of sudden death (Zylikowska 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 (>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 (Cpa) was calculated by stroke volume (SV) over pulse pressure (PP) and MPA compliance (Cmpa) by (Larea*length)/PP (length was assumed 5 cm for all MPAs). Cmpa/Ctot ratio could therefore be calculated by CMR derived flow images alone: Cmpa/Ctot = (Larea*length)/SV.

Results: Mean age in both groups was not different, mean pulmonary arterial pressure was higher in patients with an extremely dilated MPA (73 ± 9.0 mmHg) compared to patients without extremely dilated MPA (48 ± 5.4 mmHg, p = 0.02). A trend toward a higher Cmpa/Ctot 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 ≥45 mm then in patients with a diameter <45 mm.
P172
VOLUNTARY LIQUORICE INGESTION INCREASES BLOOD PRESSURE VIA MULTIPLE MECHANISMS: INCREASED VOLUME LOAD, PERIPHERAL ARTERIAL RESISTANCE, AND DECREASED AORTIC COMPLIANCE

Elina J. Hautaniemi 1, Anna M. Tavhanainen 1,2, Jenni K. Koskela 1,2, Antti J. Tikkakoski 1,2, Mika Kähönen 1,2, Marko Uitto 1, Kalle Sipilä 3, Onni Niemelä 4, Jukka Mustonen 2,6, Ilkka H. Pörsö 1,2.

1Faculty of Medicine and Life Sciences, University of Tampere, Tampere, Finland
2Department of Internal Medicine, Tampere University Hospital, Tampere, Finland
3Department of Clinical Physiology, Tampere University Hospital, Tampere, Finland
4Department of Laboratory Medicine and Medical Research Unit, Seinäjoki Central Hospital, Seinäjoki, Finland

Objectives: Liquorice consumption elevates blood pressure [1-3], but the liquorice-induced haemodynamic changes in the upright position are unknown. We investigated haemodynamics after liquorice exposure in healthy volunteers during orthostatic challenge.

Methods: Haemodynamics were recorded from 22 normotensive subjects during passive 10-minute head-up tilt before and after two weeks of liquorice consumption (glycyrrhizin dose 290–370mg/day) using radial pulse wave analysis, whole-body impedance cardiography, and spectral analysis of heart rate variability. Thirty age-matched healthy subjects maintaining their habitual diet served as controls.

Results: Liquorice ingestion elevated radial systolic (p < 0.001) and diastolic (p = 0.018) blood pressure and systemic vascular resistance (p = 0.037). During orthostatic challenge, heart rate increased less after the liquorice versus control diet (p = 0.003) and low frequency power of heart rate variability decreased within the liquorice group (p = 0.034). Liquorice intake increased central pulse pressure (p < 0.001) and augmentation index (p = 0.002) supine and upright, but in the upright position the elevation of augmentation index was accentuated (p = 0.007). Liquorice diet also increased extracellular fluid volume (p = 0.024) and aortic to popliteal pulse wave velocity (p = 0.027), and aortic characteristic impedance in the upright position (p = 0.002).

Conclusions: In addition to increased extracellular fluid volume and large arterial stiffness, two weeks of liquorice ingestion elevated systemic vascular resistance and augmentation index. Measurements performed at rest may underestimate the haemodynamic effects of liquorice ingestion, as enhanced central wave reflection and reduced chronotropic response were especially observed in the upright position.

References

P173
COUPLED NITROSO-SULFIDE SIGNALIZATION TRIGGERS SPECIFIC VASOCATIVE EFFECTS IN INTRARENAL ARTERIES OF PATIENTS WITH ARTERIAL HYPERTENSION

Sona Cacanyiova 1, Andrea Berenyiova 1, Frantisek Kristek 1, Marian Gorman 2, Karol On drias 3, Jan Breza 1, Jan Breza 3.
1Institute of Normal and Pathological Physiology, Slovak Academy of Sciences, Slovak Republic
2Institute of Clinical and Translational Research, Biomedical Research Centre, Slovak Academy of Sciences, Slovak Republic
3Department of Urology, Derer’s University Hospital, Slovak Republic

In normotensive conditions, it has been confirmed that S-nitrosothiols, as a source of NO, interact with hydrogen sulfide (H2S) and create new substance/s with specific vasoactive effects. This interaction could represent new regulator pathway also in hypertension. The aim of the study was to investigate the vasoactive effects of H2S, GSNO, and products of nitroso-sulfide signalization triggers specific in lobar arteries isolated from kidney after nephrectomy of patients suffering from arterial hypertension.

Changes in isometric tension after pre-contraction were evaluated. Acetylcholine- induced vasorelaxation was significantly reduced compared to the effect induced by exogenous NO donor, sodium nitroprusside, probably suggesting an endothelium dysfunction. While 1 μmol/l Na2S had a minimal effect on the vascular tone, 20 μmol/l evoked a slight vasorelaxation. GSNO at 0.1 μmol/l induced vasorelaxation which was significantly smaller compared to the effect induced by 1 μmol/l. The mixture of GSNO (0.1 μmol/l) and Na2S (1 μmol/l) induced significantly higher vasorelaxation compared to GSNO (0.1 μmol/l) alone only in 5th minute without the differences in the speed. On the other hand, the mixture prepared from higher concentrations of GSNO (1 μmol/l) and Na2S (10 μmol/l) induced a significantly higher (in 1st, 2nd, 5th, 10th minute) and faster vasorelaxation compared to the effect induced by GSNO (1 μmol/l) alone.

In conditions of arterial hypertension H2S in interaction with GSNO regulated a vasoconstrictor-increased arterial tone towards of more pronounced vaso- relaxation compared to GSNO alone. We confirmed for the first time that specific vasoactive effects of coupled nitroso-sulfide signalization were trig- gered also in human arterial tissue.

References
Supported: VEGA 2/0074/14, APVV-15-0565, APVV-15-037

P174
HEMODYNAMIC AND AUTONOMIC EFFECTS OF LOW-DOSE GLYCERYL TRINITRATE USED TO TEST ENDOTHELium-INDEPENDENT VASODILATION OF THE BRACHIAL ARTERY

Lorenzo Ghidoni, Stefano Taddei, Rosa Maria Bruno University of Pisa, Pisa, Italy

Background/Aim: Smooth muscle function is explored by sublingual glyceryl trinitrate (GTN) administration in vascular function protocols, in order to compare with endothelium- dependent vasodilation of the brachial artery by flow-mediated dilatation (FMD). The aim of this study is to evaluate the hemodynamic and autonomic effects of the two most often used GTN dosages.

Methods: In 80 essential hypertensive patients (HT) and 60 normotensive subjects (NT), we evaluated FMD of the brachial artery and endothelium-in- dependent response to 25 and 400 mg of sublingual GTN by high-resolution ultrasound and automated image analysis. In a subgroup of 10 HT, muscle sympathetic nerve activity (MSNA) was also assessed by microneurography.

Results: NT showed significantly (p < 0.01) lower FMD (5.5 ± 3.3%) as compared to healthy controls (6.9 ± 2.2%). The response to GTN 25μg also tended to be lower (HT 7.2 ± 3.3%; NT 7.9 ± 2.9%; p = 0.06), whereas response to GTN 400μg was similar (HT 14.3 ± 4.8%, NT 14.5 ± 5.4%, p = ns). In the whole population, changes in blood pressure (BP) induced by GTN 400μg (systolic BP - 3.2 ± 7.7, diastolic BP -4.7 ± 5.0 mmHg) were significantly higher (<0.001) compared to GTN 25μg (systolic BP -0.7 ± 5.8, diastolic BP -0.7 ± 4.4 mmHg). Changes in heart rate were also higher with GTN 400μg than with 25μg (+5.6 ± 6.4 versus -0.2 ± 5.4 bpm, p < 0.001). This behavior was similar in HT and NT subgroups. MSNA was significantly increased by GTN 400μg (31 ± 7 to 41 ± 6 bursts/min, p < 0.001) but not by 25μg (33 ± 9 to 37 ± 11 bursts/min, p = 0.19).

Conclusions: The administration of GTN at the dose of 25μg allows exploring endothelium- independent vasodilation in FMD protocols, inducing only modest hemodynamic and sympathetic responses.