P47: ABNORMAL FLOW PATTERN IN MARFAN PATIENTS IS RELATED TO AORTIC GEOMETRIC FEATURES: A 4D FLOW MRI STUDY

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To cite this article: Andrea Guala, Gisela Teixido-Tura, Jose Rodriguez-Palomares, Aroa Ruiz-Muñoz, David Garcia-Dorado, Artur Evangelista (2018) P47: ABNORMAL FLOW PATTERN IN MARFAN PATIENTS IS RELATED TO AORTIC GEOMETRIC FEATURES: A 4D FLOW MRI STUDY, Artery Research 24:C, 91–92, DOI: https://doi.org/10.1016/j.artres.2018.10.100

To link to this article: https://doi.org/10.1016/j.artres.2018.10.100

Published online: 7 December 2019
Background: Masked hypertension (MH) is prevalent in young adults and is associated with similar vascular complications as sustained hypertension, but whether this is already evident in young adults is unclear. We therefore compared retinal vessel calibres and function in response to flicker light induced provocation (FLIP) in young healthy adults stratified by MH status and explored associations between these parameters.

Methods: We retrospectively analysed hypertensive patients that were partaking in the African-PREDICT study. Participants were clinically normotensive (70% valid readings) were measured and MH status determined. The central retinal artery (CRAE) and vein equivalent (CRVE) were calculated from fundus images and retinal vessel dilation responses to FLIP determined. Results: MH showed a prevalence of 16%. MH1 had a lower CRAE (155 ± 10 μl vs. 160 ± 12 μl, p = 0.002), but similar CRVE and vessel dilation in response to FLIP when compared to normotensives. The latter findings remained consistent upon adjustment for sex, ethnicity, age and body mass index. Multivariate regression analysis demonstrated an independent association between CRAE and the presence of MH (R2 = 0.07, β = -0.10 [-0.20; -0.01]). No further associations existed between retinal vessel parameters and MH status.

Objective: Already at a young age, healthy adults with MH show slight adverse changes in the retinal microvasculature. Considering the prevalence of MH in young adults, and the predictive value of reduced CRAE, our data emphasize the early identification of altered 24 hr blood pressure patterns.

Results: From the patients included, 25 have ≥65 years and 50 <65 years. In the elderly group mean age was 71 years, 52% were female and mean BMI 28.6 Kg/m². Mean BP was 142 mmHg vs 135 mmHg for systolic and 74 mmHg vs 83 mmHg for diastolic BP, heart rate 63 bpm vs 69 bpm in elderly and younger group respectively. Mean IC results showed statistically significant differences for cardiac output, cardiac index, systemic compliance, left ventricular ejection time, velocity index and acceleration index between the groups. (Table 2) Conclusions: BP determination and control may not signify adequate hemodynamic state. With this study, elderly hypertensive patients present different hemodynamic behaviour, compared with younger ones, in variables of blood flow, resistance and contractility. These data could have potential implications on the pharmacological optimization of BP treatment.

References

Poster session I — Models, methodologies and imaging technology I
P45 IMPEDANCE CARDIOGRAPHY EVALUATION IN ELDERLY HYPERTENSIVE PATIENTS
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Objectives: Vascular aging results from endothelial dysfunction and increased arterial stiffness, a independent determinant of cardiovascular (CV) events, that is amplified by the presence and progression of arterial hypertension (AH). Age related changes in hemodynamic variables may precede negative vascular outcomes. In this study, we evaluate hemodynamic variables in elderly hypertensive patients with impedance cardiography (IC) in order to infer opportunities for therapeutic optimization.

Methods: We retrospectively analysed hypertensive patients that were included for IC evaluation. The selected 75 patients were divided into two groups, above or below 65 years old, matched by anthropometric and blood pressure (BP) values. (Table 1) Antihypertensive therapy wasn’t considered. For each group the mean of IC variables was obtained, and statistical analysis was performed by a T-student test.

Results: From the patients included, 25 have ≥65 years and 50 <65 years. In the elderly group mean age was 71 years, 52% were female and mean BMI 28.6 Kg/m². Mean BP was 142 mmHg vs 135 mmHg for systolic and 74 mmHg vs 83 mmHg for diastolic BP, heart rate 63 bpm vs 69 bpm in elderly and younger group respectively. Mean IC results showed statistically significant differences for cardiac output, cardiac index, systemic compliance, left ventricular ejection time, velocity index and acceleration index between the groups. (Table 2) Conclusions: BP determination and control may not signify adequate hemodynamic state. With this study, elderly hypertensive patients present different hemodynamic behaviour, compared with younger ones, in variables of blood flow, resistance and contractility. These data could have potential implications on the pharmacological optimization of BP treatment.

Figure 1. Relative volume, normalized for the reference value at 80mmHg, as a function of pressure during systole, calculated before and after considering the axial extension of the aorta.

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Introduction: Ascending aorta aneurysm and dissection are the most common cardiovascular complications affecting Marfan syndrome patients (MFS). Recent large increase in life expectancy of MFS patients (MFS). Recent large increase in life expectancy of MFS driven the growing prevalence of descending aorta (DAO) dilation and dissection. Despite local abnormal vortices in the proximal Dao were related to local dilation, their origins have never been explored. We investigated the link between aortic geometrical characteristics and abnormal flow pattern in the thoracic aorta of MFS.

Methods: Fifty-tree MFS without significant aortic valve disease and forty age-matched healthy volunteers (HV) were prospectively included in 4D flow-MRI study, obtaining flow field and angiography. Spatial distribution of flow (in-plane rotational flow (IRF) and systolic flow reversal ratio (SFRR))
and geometric (diameter, ellipticity and curvature) parameters were investigated.

Results: Compared to HV, MFS presented larger aortic diameters only in the proximal Ao (p = 0.001) and D Ao (p = 0.028). Increased ellipticity and a more distal location for the peak of aortic curvature were evident, even in the absence of dilation. Through most of the thoracic aorta, IRF was substantially lower in MFS, while SFRR was larger. Interestingly, non-dilated MFS had decreased IRF in the thoracic aorta compared to HV, although SFRR was not increased. Statistically-significant bivariate relations were found between arch IRF and arch ellipticity (R = -0.34) and proximal D Ao peak curvature (R = -0.35). Local diameter was negatively correlated with local IRF (R = -0.3) and positively correlated to local SFRR (R = 0.605).

Conclusions: MFS presented altered ellipticity and curvature distribution, which are related to abnormal flow patterns even in the absence of dilation.

P48 COMPARISON BETWEEN INVASIVE AND NON-INVASIVE METHODS: TO EVALUATE AORTIC STIFFNESS BY PULSE WAVE VELOCITY
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Objective: To investigate if invasively measured aortic pulse wave velocity (PWV) is accurately estimated by non-invasive methods purporting to assess it.

Methods: One-hundred and two patients (30% female, age 65 ± 13 years) planned to undertake coronary angiography were evaluated with the following non-invasive devices: BPLab (Petr Telegin, Russia), Compilor Analyse (Alam Medical, France), Mobil-O-Grap (IEM, Germany), pOmphétre (Axe Life, France), PulsePen-ET, PulsePen-ETT (Diatecne, Italy) and SphygmoCor (Atcor, Australia). Aortic PWV was measured by aortic catheterization and simultaneous measurement of pressure waves above the aortic valve and at the aortic bifurcation (FS-Stiffchat, Flag Vascular, Italy).

Results: The devices evaluating carotid-femoral PWV showed a very strong agreement between each other (r2 > 0.65) and with invasive aortic PWV (mean difference = 0.03 ± 2.83 m/s (r = 0.41) for Compilor-Analyse; 0.20 ± 2.54 m/s (r = 0.51) for PulsePen-ETT; -0.04 ± 2.33 m/s (r = 0.61) for PulsePen-ETT; -0.61 ± 2.57 m/s (r = 0.49) for SphygmoCor). The finger-toe PWV, evaluated by the pOmphétre, and the PWV measured by BPLab showed a weak relationship with invasive PWV (respectively r = 0.12, 0.05), with carotid-femoral PWV measurements (r = 0.11, 0.010) and with age (r = 0.10, 0.06). PWV estimated with Mobil-O-Graph through a proprietary algorithm showed a good agreement with invasive PWV (mean difference ± SD = -1.01 ± 2.54 m/s; r = 0.51) and appeared to be strictly dependent on age-squared and peripheral systolic blood pressure (r2 > 0.99).

Conclusions: Methods estimating carotid-femoral PWV should be considered the only non-invasive approach to reliably assess aortic stiffness. Aortic PWV estimates valued by Mobil-O-Graph algorithm are also significantly related to invasive PWV, but do not offer any additional information on top of what provided by age and systolic blood pressure levels.

P49 QUANTIFYING WAVE REFLECTION IN CHILDREN: INVASIVE VS NON-INVASIVE CENTRAL AUGMENTATION INDEX AND REFLECTION MAGNITUDE AND THEIR ASSOCIATION WITH LEFT VENTRICULAR MASS
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Objective: The aims of this study in children were to 1) evaluate two brachial oscillometric devices for estimating central augmentation index (AIx) and reflection magnitude (RM), and 2) test whether AIx or RM are associated with left ventricular mass index (LVMI).

Methods: Intra-aortic (IA) AIx was calculated from high-fidelity pressure measured with a Verrata wire (Philips Volcano) in 60 children (9.2 ± 4.7 years) with unobstructed aorta undergoing clinically-indicated catheterisation. AIx was also obtained from SphygmoCor XCEL (SC, Atcor) and/or Mobil-O-Graph (MB, IEM) brachial oscillometric devices. RM(IA) was calculated using wave separation using a representative normalised flow waveform obtained from MRI in a separate group of normal adolescents, RM(SC) via the triangulation method, and RM(MB) provided by the proprietary software. LVMI was estimated using echocardiography.

Results: Invasive vs non-invasive AIx and RM are compared in the Table. AIx(IA) correlated weakly with Alx(SC) (R = 0.27, P = 0.04) but not Alx(MB) (P = 0.4). Neither RM(SC) nor RM(MB) correlated with RM(IA) (P = 0.13 and P = 0.96 respectively). RM(IA) was moderately correlated with Alx(IA) (R = 0.69, P < 0.001) and weakly correlated with Alx(SC) (R = 0.36, P = 0.007) but not Alx(MB) (P = 0.7). In a multivariable regression, height (P = 0.001) and RM (IA) (P = 0.04) were independently and positively associated with LVMI (adjusted R2 = 0.24), whereas there were no associations of any AIx or non-invasively estimated RM with LVMI. Conclusion: Central AIx and RM were poorly estimated by SC and MB in children. Unlike RM(IA), none of the non-invasive indices of wave reflection correlated with LVMI, likely due to inadequate estimation of the central pressure waveform shape in this age group.