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P.038: SIMULTANEOUS DETERMINATION OF WAVE SPEED AND THE ARRIVAL TIME OF REFLECTED WAVES USING THE PRESSURE-VELOCITY LOOP

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with normal erectile function (8.9 vs 8.3 m/s, $p < 0.05$). Compared with men without ED, ED patients had significantly higher levels of C-reactive protein (CRP), ($p < 0.05$), IL-1 β ($p = 0.01$), TNF- α ($p < 0.01$), sVCAM-1 and sICAM-1 ($p < 0.05$ for both). IIEF-5 score was negatively associated with PWV ($r = -0.30$, $p = 0.01$), CRP ($r = -0.27$, $p < 0.05$), IL-1 β ($r = -0.25$, $p < 0.05$), TNF- α ($r = -0.32$, $p < 0.01$), sVCAM-1 ($r = -0.24$, $p < 0.05$) and sICAM-1 ($r = -0.40$, $p < 0.001$).

Conclusion: ED and aortic stiffness are related in men with MetS and may contribute to their raised cardiovascular risk through impaired endothelial function elicited by an increased vascular inflammatory state.

P.035

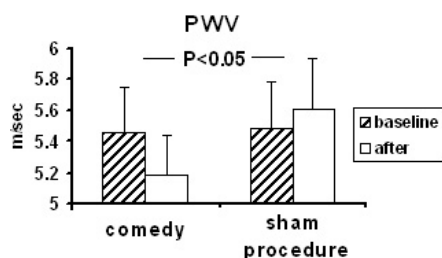
BENEFICIAL EFFECT OF LAUGHTER ON AORTIC STIFFNESS

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Background: Unfavourable psychogenic factors may increase the risk of cardiovascular outcomes. We have previously shown that mental stress has an acute detrimental effect on aortic stiffness, which is a determinant of cardiovascular performance and predictor of the corresponding risk. Aim of the present study was to evaluate the impact of laughter on aortic elastic properties.

Methods: Thirteen healthy volunteers (age 27 ± 5 years) were enrolled in the study, which was carried out on two separate arms, one with viewing of a 30 minutes long segment of a comedy, and one with sham-procedure, according to a randomized, single-blind, cross-over design. During the sham-procedure arm the subjects rested for 30 minutes and nothing was projected. Carotid-femoral pulse wave velocity (PWV) was measured as an index of aortic stiffness using an automated, non-invasive device (Complior[®]), before (baseline) and shortly after the movie.

Results: No significant change in blood pressure and heart rate was observed after watching the comedy. However, comedy led to a significant decrease in PWV (decrease by 0.39 m/s compared to the sham-procedure, $P < 0.05$, figure), indicating a decrease in aortic stiffness.



Conclusions: This study shows for the first time that laughter has a favorable effect on aortic elastic properties. This finding provides valuable insights into the effect of laughter on the cardiovascular system, expanding the ways in which aortic stiffness can be decreased beyond pharmacological approaches.

P.036

ADMA - A SENSITIVE MARKER OF ENDOTHELIAL DYSFUNCTION IN CHILDREN WITH FAMILIAR HYPERCHOLESTEROLEMIA AND DIABETES MELLITUS TYPE 1

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Background: children with familiar hypercholesterolemia (FH) and diabetes mellitus type 1 (DM1) are considered to be high risk groups for the early manifestation of atherosclerosis. Endothelial dysfunction (ED) should be assessed in the preclinical stage, before clinical symptoms of vascular complications occur. Besides ultrasonographic methods there are many biochemical markers of ED whose varying sensitivity and specificity make diagnosis of ED in children difficult.

Methods: high selective CRP (hsCRP), oxidized LDL (oxLDL), malondialdehyde (MDA) and asymmetric dimethylarginine (ADMA) were assessed in three groups of children. FH group ($n = 29$, mean age 13.9 years, on a low-fat diet 17, statins 6, resins 6), DM1 group ($n = 22$, mean age 14.5 years, average duration 4.8 years) and a group of healthy controls ($n = 17$, mean age 15.3 years). Flow mediated dilation (FMD) and Deceleration index (DI) were measured simultaneously. Biochemical markers were then correlated with the ultrasonographic markers of ED.

Results: ADMA levels in the FH group were 0.97 $\mu\text{mol/l}$ (SE 0.03), DM1 group 0.85 $\mu\text{mol/l}$ (SE 0.05) and in healthy controls 0.70 $\mu\text{mol/l}$ (SE 0.04). Statistically significant differences were found between the FH group and

healthy controls ($p < 0.00001$), and between DM1 group and healthy controls ($p < 0.01$). Differences in Hcy, hsCRP, OxLDL and MDA in these groups were not statistically significant. Interestingly both ultrasonographic methods used in this study did not show any significant difference between the study and control groups.

Conclusion: ADMA appears to be a more sensitive marker for the detection of ED than currently used ultrasonographic methods in children. Unlike other tested biochemical markers of ED, ADMA could be an important factor determining the treatment strategy. Nevertheless the combination of biochemical and ultrasonographic markers should continue to play an essential role in the treatment strategy in high risk children.

P.037

INCREASED AORTIC STIFFNESS ALTERS THE LEFT VENTRICULAR ROTATION IN PATIENTS WITH NON-ISCHEMIC DILATED CARDIOMYOPATHY

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We hypothesized that altered proximal aorta stiffness may affect left ventricular (LV) rotation in patients with non-ischemic dilated cardiomyopathy (NIDC). Therefore, we examined 34 angiographically proven NIDC patients (aged 52.6 ± 13.9 years) and 34 healthy volunteers. The proximal aorta (AO) pulse wave velocity (PWV) was assessed by echocardiography. The LV diastolic function was evaluated by pulsed-wave Doppler while tissue Doppler (TDI) velocities from the septal and the base lateral wall were obtained. The cardiac rotation and rotation rate were evaluated by speckle echocardiography (EchoPac, GE). Rotation and rotation rate were calculated as the average angular displacement of 6 myocardial regions (anterior, anteroseptal, lateral, posterior, inferior and septal).

Patients had increased PWV (6.7 ± 2.1 vs. 5.2 ± 1.4 m/s, $p = 0.01$) and decreased systolic cardiac rotation (-2.6 ± 2.5 vs. $-4.7 \pm 1.7^\circ$, $p = 0.01$) compared to controls. Patients had decreased systolic rotation rate (-38.6 ± 8.7 vs. $-51.7 \pm 22.3^\circ/\text{s}$, $p = 0.04$), early (28.1 ± 20 vs. $49.9 \pm 35.2^\circ/\text{s}$, $p = 0.01$) and late (24.9 ± 13.2 vs. $39.7 \pm 10.8^\circ/\text{s}$, $p = 0.002$) diastolic untwisting rate compared to controls. LV ejection fraction showed no correlation with the LV rotation and rotation rate in patients. PWV was correlated with E' (mean TDI velocity of the septal and the lateral wall) ratio, with the segmental and averaged systolic ($r = -0.52$, $p = 0.001$) and the early diastolic ($r = 0.027$, $p = 0.05$) rotation rate in patients.

We conclude that NIDC patients had increased aorta stiffness which impaired the systolic LV rotation movement affecting thus the LV systolic and diastolic function. Destiffening therapeutic interventions may be beneficial in these patients.

P.038

SIMULTANEOUS DETERMINATION OF WAVE SPEED AND THE ARRIVAL TIME OF REFLECTED WAVES USING THE PRESSURE-VELOCITY LOOP

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We previously demonstrated that the linear portion of the pressure-velocity loop (PU-loop) corresponding to early systole could be used to calculate the local wave speed. In this work we extend the results of this method to show that determination of the time at which the PU-loop first deviates from the linearity provides a convenient way to determine the arrival time of the reflected wave.

Pressure and flow were measured in elastic tubes of different diameters, where a strong reflection site existed at known distances away from the measurement site. Pressure and flow were also measured in the ascending aorta of 11 anaesthetised dogs where a strong reflection site was produced through total arterial occlusion at 4 different sites. The arrival time of the reflected wave was determined using a new algorithm that detects the sampling point at which the initial linear part of the PU-loop deviates from linearity by comparing the relative difference of slopes to an empirically determined threshold.

In elastic tubes the arrival time of reflected waves detected using the PU-loop was almost identical to that detected using wave intensity analysis and foot-to-foot methods with a maximum difference of 5%. Arrival time of reflected waves detected using the PU-loop *in vivo* highly correlated with that detected using wave intensity analysis ($r^2 = 0.94$, $P < 0.001$).

We conclude that the new technique described in this paper is easy to use, its results are comparable to those of traditional techniques, and allows for the dynamic determination of wave speed and the arrival time of reflected waves, simultaneously.