

patients with systemic hypertension without OSA (Hyper) and 7 patients with systemic hypertension and moderate-to-severe OSA (Hyper+OSA). The three groups were matched for BMI and age. Hyper+OSA had shorter RR interval (749 ± 28 ms) compared with Hyper (836 ± 29 ms) and Controls (989 ± 41 ms; $p < 0.001$ for both comparisons). In Hyper+OSA, total variance of RR was reduced (1082 ± 117 ms; $p < 0.001$ for both comparisons) and spectral analysis of RR variability showed an increased low frequency normalized units (78 ± 5), index of sympathetic modulation (LF NU), a decreased high frequency normalized units (21 ± 6), index of vagal modulation (HF NU) compared with both Controls and Hyper ($p = 0.001$) as well as an increased LF/HF ratio (2.43 ± 1.09). Systolic blood pressure (SBP) variance in Hyper+OSA (59 ± 10 mmHg) was greater than in Hyper (37 ± 6 mmHg), and twofold greater than in Controls (22 ± 5 mmHg) ($p < 0.001$) as well as the LF component. α index was significantly reduced in Hyper (5.2 ± 1.5 ms/mmHg) and Hyper+OSA (4.9 ± 1.3 ms/mmHg) compared with Controls (10 ± 2.7 ms/mmHg).

Conclusions: Hypertension associated with moderate-to-severe OSA is characterized by a greater increase in cardiac and vasomotor sympathetic drive than hypertension per se. This sympathetic overactivity may play an important role both in determining the high levels of arterial pressure in patients with OSA as well as in increasing their cardiovascular risk.

1009-170

Accumulated Physical Activity Improves Arterial Compliance and Pressure Load Indices in Hypertensive African-American Women

Beth A. Staffileno, Ann F. Minnick, Andrius Dumasius, Steven M. Hollenberg, Rush University Medical Center, Chicago, IL

Background: Arterial elasticity and pressure load indices serve as early markers for vascular disease. The prevalence of hypertension and target organ injury is disproportionate among African-American women compared to Caucasians. Therefore, this ongoing study examines the effects of a prescribed exercise program on arterial elasticity and blood pressure indices in sedentary, untreated, mildly hypertensive African-American women aged 18-45.

Methods: This single-blinded, randomized, parallel-group design in which women ($n = 5$ to date) were randomized to an 8-week intervention comprising a program of physical activity for 10 minutes, 3-times/day, 5-days/week at 50-60% heart rate reserve. Women in the control group ($n = 7$ to date) continued with their usual activities. Large (C1) and small (C2) artery elasticity was measured noninvasively by radial waveform analysis using a modified 2-element Windkessel model. Pressure load (the percentage of daytime measurements $>140/90$ mmHg and nighttime $>120/80$ mmHg) was measured by 24-hour ambulatory blood pressure monitoring. Mean changes in arterial compliance and pressure load indices were compared using paired t-tests.

Results: Physical activity increased C1 by 8%, from 11.3 ± 3.3 to 12.2 ± 2.9 mL/mmHg $\times 10$ ($p = .038$) and C2 increased by 13.8%, from 6.0 ± 2.7 to 6.8 ± 3.3 mL/mmHg $\times 100$, although this did not reach statistical significance. Physical activity also produced greater reductions in pressure load indices, especially at night. Nighttime diastolic pressure load decreased by 39.8%, from 65.7 ± 15.7 to 39.5 ± 14.1 % ($p = .021$). **Conclusions:** Moderate-intensity physical activity provided a beneficial effect on arterial elasticity and pressure load indices in this study. These findings suggest potential benefits from physical activity in hypertension-prone African-American women, particularly given their excess burden of pressure-related complications and the strong correlation between arterial stiffness, pressure load and target organ injury.

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1009-193

Predictors of Diastolic Hypertension: The Framingham Heart Study

Stanley S. Franklin, Jose R. Pio, Nathan D. Wong, Martin G. Larson, Eric P. Leip, Ramachandran S. Vasan, Daniel Levy, University of California, Irvine, Irvine, CA, Framingham Heart Study, Framingham, MA

Background: Diastolic hypertension (DH), defined as a diastolic blood pressure (DBP) ≥ 90 mmHg, occurs most often with systolic blood pressure (SBP) ≥ 140 mmHg (systolic-diastolic hypertension, SDH) and occasionally with SBP < 140 mmHg (isolated-diastolic hypertension, IDH); however, factors in the development of DH are poorly understood.

Methods: Participants in the Framingham Heart Study were included in this investigation if they underwent 2 biennial examinations in 1953-1957 and were free of antihypertensive therapy and cardiovascular disease. Baseline blood pressure (BP) was the average of those recorded at both biennial examinations. The 10-year incidence of SDH and IDH in each BP category was examined.

Results: Sex and age-adjusted incidence rates of SDH were 8.5, 25.1, 56.9, 111.4 and 80.1 per 1000-person-years for persons in optimal, normal, high-normal BP, IDH and isolated-systolic hypertension (ISH) groups, respectively. Incidence rates for IDH were 6.8, 17.4, 24.9, 12.3, and 6.3, per 1000-person years for optimal, normal, and high-normal BP, SDH and ISH, respectively. Compared with optimal BP, hazard ratios (HR) and 95% CI for developing SDH, after adjusting for age, sex, and other risk factors, were 3.14 (2.44-4.043) for normal, 8.25 (6.42-10.61) for high-normal, 10.76 (8.03-14.43) for ISH, and 18.01 (13.20-24.56) for IDH. 68% of persons with IDH developed SDH during the 10-year follow up. Compared with optimal BP, HR for IDH were 2.45 (1.86-3.23) for normal, 3.52 (2.63-4.72) high-normal, 1.57 (1.06-2.31) for SDH, and 0.82 (0.45-1.50) for ISH. In addition to BP, predictors of SDH were high body mass index (BMI) at baseline and weight gain. In addition to BP, predictors of IDH were younger adult age, male sex, being a non-smoker, high BMI at baseline and weight gain.

Conclusions: Normal and High-normal BP (prehypertension) had the highest HR for new onset of IDH. In addition to prehypertension, ISH, and especially IDH had high HRs for the new onset of SDH, which carries increased risk for future cardiovascular disease. Identification of prehypertensive persons with lifestyle problems, particularly being overweight, is crucial in preventing the development of DH.

1009-194

Comparison of Intra-Arterial and Noninvasive Oscillometric Blood Pressure in Lean, Overweight, and Obese Subjects

Ernesto Umara, Waqas Ahmed, Martin A. Alpert, St. John's Mercy Medical Center, St. Louis, MO, University of South Alabama Medical Center, Mobile, AL

Background: Controversy exists concerning the accuracy of non-invasive blood pressure (BP) measurements in obese persons. This study compares intra-arterial and non-invasive oscillometric BP in lean, overweight, class I and II obese and class III persons (World Health Organization classification).

Methods: Aortic-root (AR) and oscillometric (Dinamap XL) systolic and diastolic BP were obtained simultaneously in consecutive hemodynamically stable patients undergoing cardiac catheterization. Cuff sizes were selected in accordance with standard guidelines.

Results: There were 50 lean, 49 overweight, 61 class I/II obese and 28 class III obese patients. There were significant positive correlations between AR and oscillometric systolic BP's in lean ($r = 0.902$, $p < 0.0001$), overweight ($r = 0.783$, $p < 0.0001$), class I/II obese ($r = 0.805$, $p < 0.0001$) and class III obese ($r = 0.656$, $p < 0.0001$) subjects. There were significant positive correlations between AR and oscillometric diastolic BP's in lean ($r = 0.920$, $p < 0.001$) overweight ($r = 0.356$, $p < 0.015$), class I/II obese ($r = 0.536$, $p < 0.0005$) and class III obese ($r = 0.721$, $p < 0.0005$) subjects. Respective mean systolic AR and oscillometric BP's (mmHg) were 152 ± 34 and 145 ± 30 in lean patients, 150 ± 25 and 142 ± 30 in overweight patients, 157 ± 31 and 147 ± 22 in class I/II obese patients and 159 ± 25 and 150 ± 24 in class III obese patients. Respective mean diastolic AR and oscillometric BP's were 76 ± 13 and 85 ± 15 in lean subjects, 76 ± 13 and 86 ± 12 in overweight subjects, 81 ± 14 and 85 ± 12 in class I/II obese subjects and 79 ± 13 and 84 ± 14 in class III obese subjects. The differences between mean AR and oscillometric systolic and diastolic BP's were significant ($p < 0.01$) in all weight groups.

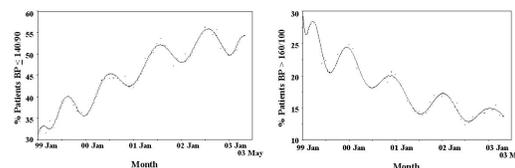
Conclusions: There is good correlation between AR and oscillometric BP's in lean, overweight and obese subjects. However, oscillometric BP measurement using a Dinamap XL underestimates systolic BP and overestimates diastolic BP to a similar extent in lean, overweight, class I/II obese and class III obese subjects.

1009-195

The Effect of Seasonal Variation of Blood Pressure When Analyzing Improvement and Treating Large Groups of Hypertensives Patients

Ross D. Fletcher, Madhulika Agarwal, Christopher D. McManus, Vasilios Papademetriou, Ronald E. Jones, Department of Veterans Affairs Medical Center, Washington, DC, Georgetown University Medical Center, Washington, DC

Background: The VA Computerized Medical Record records all Blood Pressures (BP) measurements on both in and out patients. Hypertension was defined by at least 3 or more BP above 140/90 on 3 separate days in 10,476 patients. **Methods:** We measured % of hypertensives who became normal $\leq 140/90$, the % who remained severe $\geq 160/100$, and the number of hypertensive medication classes. This data was fed back to the individual provider. **Results:** In 4 years the % patients returning to normal increased from 33% to 56% ($p < 0.0001$). Patients with BP $\geq 160/100$ fell from 26% to 12% ($p < 0.0001$). When monthly data is displayed (see graphs), a repetitive pattern is present where the % returning to normal is largest in the summer and reduced in the winter (7.7 ave % change) $p < 0.0001$. Patients $\geq 160/100$ are smallest in the summer and largest in the winter ($p < 0.0001$). Patients with severe elevations were on 2.21 ± 1.17 classes of drugs while those with mild elevations were on 1.86 ± 1.16 ($p < 0.0001$). Diuretics were used by 42 % of the patients. **Conclusions:** Continuous improvement has occurred with data feed back to providers. Performance measured by patients $\leq 140/90$ improves each summer and worsens each winter. True improvement should be determined by comparing data for the same time each year for groups and individuals. Further improvement may occur by the increased use of 3 classes of drugs especially diuretics. Increasing therapy in the winter months might also improve control both for groups and individual patients.



1009-196

Acute Arterio-Venous Fistula Occlusion Reduces Sympathetic Nerve Traffic and Increases Baroreflex Sensitivity in Patients With Kidney Transplant

Sonia Vélez-Roa, Agnieszka Ciarka, Jolanta Neubauer, Martin Wissing, Alberto Porta, Virend K. Somers, Philippe Unger, Jean-Paul Degaute, Philippe van de Borne, Erasme Hospital, Brussels, Belgium, Mayo Clinic, Rochester, MN

Background: The acute bradycardia induced by the occlusion of an arteriovenous fistula (AVF), known as the Nicoladoni-Branham sign, is considerably larger than that which occurs during a carotid sinus massage. This suggests increased arterial baroreflex sensitivity during acute AVF occlusion. Moreover, the influence of acute AVF occlusion on muscle sympathetic nerve traffic (MSNA, by microneurography) is unknown. We therefore assessed the effects of acute AVF occlusion on baroreflex sensitivity and on MSNA in patients with stable functional kidney grafts and patent AVF.

Design and Methods: We measured blood pressure (BP), MSNA ($n = 11$), heart rate (HR), cardiac output (CO) and arterial baroreflex sensitivity ($n = 18$) at baseline and during acute, 30-second pneumatic AVF occlusions in 23 renal transplant recipients.

Results: During the first 5 seconds of the AVF occlusion, mean BP increased from 98 ± 4

to 112±4 mmHg (p<0.0001) while MSNA decreased to 28±5% of baseline values (p<0.0001) and HR decreased from 71±3 to 61±3 bpm (p<0.0001). The largest increases in BP were accompanied by the most marked decreases in MSNA (r=-0.79, p=0.003) and HR (r=-0.49; p=0.01) during the first 5 seconds of the AVF occlusion. During AVF occlusion baseline CO of 6.9±0.3 decreased to 5.6±0.3 l/min (p<0.0001) while baroreflex sensitivity increased from 10±1 to 17±2 ms/mmHg (p<0.001). Conclusions: Arterial baroreceptor activation and increased arterial baroreflex sensitivity decrease heart rate during AVF occlusion. In addition our study is the first to demonstrate that arterial baroreflex activation decreases sympathetic nerve traffic during the Nicola-doni-Branham sign.

1009-197

Preeclampsia: An Under-Recognized Risk Factor for Hypertension Later in Life

Ahmad A. Eylesber, Stephen T. Turner, Kenneth P. Offord, Vesna D. Garovic, Mayo Clinic, Rochester, MN

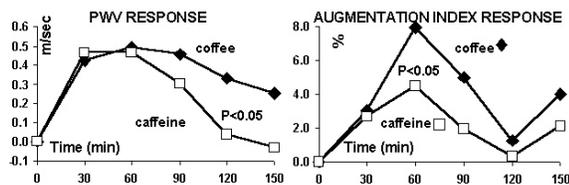
Background: Preeclampsia is a pregnancy-specific disorder that occurs in 3-5% of pregnancies. It is a multisystem disease characterized by hypertension (blood pressure ≥140/90 mmHg) and proteinuria (protein level ≥ 300mg/24-hour urine). It remains unclear if preeclampsia is associated with an increased risk for cardiovascular disease later in life. The aim of this study was to assess the frequency of subsequent hypertension in a group of women who were diagnosed with preeclampsia, eclampsia, or toxemia more than 20 years ago. **Methods:** We reviewed Rochester Mayo Clinic medical records between 1960-1979 and mailed hypertension questionnaires to 144 women who were diagnosed with any of these 3 conditions. Our control group consisted of 154 women who did not have a history of preeclampsia. We received 103 completed questionnaires for the cases group (response rate 71.5%) and 96 for the control group (response rate 62%). **Results:** There were no significant differences in age, race, education, parity, and time interval from index pregnancy to survey completion date between cases and controls. Women with histories of preeclampsia reported a higher frequency of hypertension compared to women with normal pregnancies: 52/103 (50%) vs. 23/96 (24%), respectively (p<0.0001). **Conclusion:** History of preeclampsia, eclampsia, or toxemia is associated with an increased risk for hypertension later in life. The list of risk factors common for both atherosclerosis and preeclampsia is extensive, including obesity, endothelial dysfunction and oxidative stress. The association between preeclampsia and atherosclerotic disease later in life remains to be determined.

1009-198

Coffee Has a More Potent Effect on Arterial Stiffness Than Caffeine

Charalambos Vlachopoulos, Nikolaos Ioakeimidis, Nikolaos Alexopoulos, Konstantinos Aznaouridis, Foteini Kosmopoulou, Dimitris Tousoulis, Christos Pitsavos, Christodoulos Stefanadis, Athens Medical School, Athens, Greece

Background: Large arteries stiffness and arterial wave reflection are prognosticators of cardiovascular risk and are involved in the pathogenesis of hypertension. Whether there is a differential effect of coffee and caffeine on arterial function has not been defined. **Methods:** We studied 10 healthy volunteers (33±11 yrs) in a randomized, sham-procedure controlled, crossover fashion on 3 separate occasions receiving: a) a triple espresso b) 240mg of caffeine alone (= amount contained in a triple espresso) and c) placebo. Carotid-femoral pulse wave velocity (PWV) was measured as an index of aortic stiffness using an automated, non-invasive device (Complior®) and augmentation index (AIx) as a measure of wave reflection using a validated system (Sphygmocor®). **Results:** Both coffee and caffeine increased PWV and AIx indicating increased aortic stiffness and wave reflection, however, the effect of coffee was more pronounced (figure). Pressures also increased, however, the increases were less discernible between coffee and caffeine (e.g. aortic systolic increased by 10.8 and 8.8 mmHg respectively). **Conclusions:** Both coffee and caffeine increase aortic stiffness and wave reflection, however, the effect of coffee is more potent. These findings are particularly important for the precise evaluation of their consequences on the cardiovascular system. Furthermore, they indicate that the terms "coffee" and "caffeine" should not be used indistinguishably in the design and interpretation of studies.



POSTER SESSION

1027

Mechanisms and Implication of Vascular Dysfunction

Sunday, March 07, 2004, Noon-2:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 1:00 p.m.-2:00 p.m.

1027-183

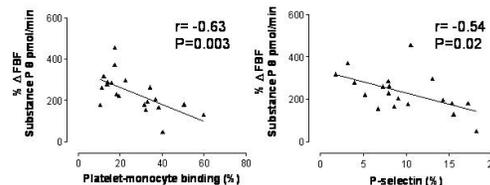
Functional Interplay Between Endothelial Dysfunction and Platelet Activation in Patients With Stable Coronary Heart Disease

Simon D. Robinson, Scott A. Harding, Paula Cummins, Jaydeep Sarma, I. Davidson, Keith A. Fox, Nicholas A. Boon, David E. Newby, University of Edinburgh, Edinburgh, United Kingdom, Lothian University Hospital NHS Trust, Edinburgh, United Kingdom

Background: Impaired endothelium dependent vasodilatation is an independent predictor of acute atherothrombotic events although the biological basis for this is uncertain. Endothelium-derived nitric oxide and prostacyclin strongly inhibit platelet activation. Platelet-monocyte binding (PMB) and platelet surface expression of P-selectin are sensitive markers of platelet activation. We determined the relationship between endothelium dependent vaso-relaxation and platelet activation in patients with stable coronary heart disease (CHD).

Methods: Twenty male subjects with angiographically confirmed CHD were recruited. All subjects were receiving aspirin and had stable symptoms. PMB and platelet surface expression of P-selectin were assessed using 2-colour flow cytometry on whole blood. Forearm blood flow (FBF) was assessed using venous occlusion plethysmography during intra-arterial infusions of the endothelium dependent vasodilator substance P (2-8 pmol/min) and the endothelium independent vasodilator sodium nitroprusside (2-8 mcg/min).

Results: PMB and P-selectin expression were strongly correlated with maximal endothelium dependent, but not endothelium independent, vasodilatation (figure 1). **Conclusions:** In patients with CHD there is a strong inverse relationship between endothelium dependent vasomotor function and platelet activation. This suggests a direct mechanism whereby endothelial dysfunction increases the risk of acute atherothrombotic events.



1027-186

High Angiotensin II Responsiveness Relates to Decreased Endothelium Dependent Relaxation in Human Arteries

Peter Paul van Geel, Yigal M. Pinto, Hendrik Buikema, Adriaan A. Voors, Margreth Oosterga, Dirk Jan van Veldhuisen, Wiek H. van Gilst, University of Groningen, Groningen, The Netherlands, University Hospital Groningen, Groningen, The Netherlands

Background: We investigated the relation between Angiotensin II (Ang II) responsiveness and endothelium dependent relaxation (EDR) in isolated human arteries. Angiotensin converting enzyme (ACE) inhibition, which is known to modulate Ang II responsiveness, was studied in this relation.

Methods: Hundred eighty-seven patients, undergoing coronary bypass surgery, were randomized to receive an ACE-inhibitor or placebo, one week prior to surgery. Segments of the internal mammary artery (IMA) were exposed in organ bath experiments to methacholine (ME; 10 nmol/l - 0.1 mmol/l) after precontraction with phenylephrine (PE; 10 μmol/l). After washing and renewed stabilization, the rings were preincubated with NG - monomethyl-L-arginine and exposed to increasing concentrations of Ang II (0.1 nmol/l - 1 μmol/l), followed by a control response to PE (10 μmol/l).

Results: There was a significant inverse relation between maximal Ang II (%PE) contraction and maximal ME (%PE) relaxation. Patients with the highest contraction to Ang II showed the lowest ME relaxation (r=0.312; p=0.003). ACE-inhibition significantly increased Ang II sensitivity (p=0.03). This increase was accompanied by a tendency toward decreased EDR (p=0.07).

Conclusion: High Ang II responsiveness inversely correlates to EDR in IMA's of patients with established coronary artery disease. ACE-inhibition, which in itself increases the response to Ang II, had an adverse effect on EDR. These findings suggest that any type of increased Ang II responsiveness may adversely affect endothelial function.