DIFFERENTIAL EFFECTS OF ANTIHYPERTENSIVE DRUG THERAPY ON ARTERIAL COMPLIANCE

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Although the abnormal vascular compliance, ΔV/ΔP, characteristic of essential hypertension can be improved by antihypertensive drug therapy, it is not clear whether these changes a) can be attributable solely to lower achieved BP and pulse pressure values, and therefore b) are equally likely with different drugs possessing similar antihypertensive efficacy. We therefore used computerized arterial pulse waveform analysis (CAPWA) of the radial artery to measure capacitative (C1) and oscillatory (C2) components of arterial compliance in essential hypertensive subjects (n = 39) before and three months after administration of dihydropyridine calcium channel antagonists (CaBl), converting enzyme inhibitors (CEI), angiotensin receptor blockers (ARB), and beta-blockers (Bbl). Results showed:

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>ΔBP (mmHg)*</th>
<th>%ΔC1</th>
<th>%ΔC2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CaBl (n = 11)</td>
<td>−19 ± 4/−15 ± 2</td>
<td>30.0 ± 5.8*</td>
<td>43.7 ± 23.3*</td>
</tr>
<tr>
<td>CEI (n = 9)</td>
<td>−12 ± 3/−13 ± 2</td>
<td>32.7 ± 5.4*</td>
<td>26.7 ± 7.1*</td>
</tr>
<tr>
<td>ARB (n = 9)</td>
<td>−10 ± 3/−12 ± 2</td>
<td>36.3 ± 11.8*</td>
<td>43.6 ± 23.1*</td>
</tr>
<tr>
<td>Bbl (n = 10)</td>
<td>−14 ± 3/−12 ± 2</td>
<td>−3.9 ± 7.6**</td>
<td>−7.0 ± 11.5**</td>
</tr>
</tbody>
</table>

*p < 0.005 vs initial BP, C1, or C2. **sig = 0.01 vs other drug despite equivalent effects on BP, CaBl, CEI, and ARB, but not Bbl significantly improved arterial compliance.

We conclude that for the same effect on BP: i) arterial compliance improves following therapy with some, but not all antihypertensive drugs, and ii), greater clinical benefit may result from the preferential use of drugs that concomitantly improve arterial compliance.

Key Words: Arterial compliance; pulse waveform analysis; drug therapy

ANTIOXIDANT VITAMINS INHIBIT PROGRESSION OF HYPERTENSION AND IMPROVE ENDOTHELIAL DYSFUNCTION AND ANTIOXIDANT STATUS IN SHRSP

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We investigated effects of vitamins C and E on blood pressure elevation, vascular remodeling and endothelial function in salt-loaded stroke-prone SHR (SHRSP). The role of oxidative stress was also assessed in these processes. 16 week-old SHRSP (n = 16) on a high salt diet (4% NaCl) were randomly divided into 3 groups: control (C), Vit C (1000 mg/d) and Vit E (1000 IU/d). Systolic blood pressure (SBP) and plasma antioxidant status (spectrophotometric assay system) were assessed weekly. 6 weeks after treatment rats were killed. Vascular structure (media:lumen ratio) and endothelial function (ACH-induced vasodilation) were assessed in mesenteric arteries. Vascular •O₂⁻ production was measured in aortic vessels using lucigenin (5 μM). SBP increased progressively from 204 ± 9.4 to 246 ± 5.6 mmHg in C group. Progression of hypertension was prevented in Vit C (210 ± 5 mmHg) and Vit E (209 ± 11 mmHg) groups. Ach-induced dilation was significantly improved in the treated groups. Media:lumen ratio was reduced (p < 0.001) in Vit E group (6.8 ± 0.8%) vs C group (12.3 ± 0.1%). Total antioxidant status was significantly improved (p < 0.05) in the Vit C (1.3 ± 0.2 mM) and Vit E (1.68 ± 0.4 mM) groups compared with C (0.87 ± 0.1 mM). •O₂⁻ production was significantly lower in both Vit-treated groups compared with the untreated group.

Vits C and E improved endothelial dysfunction in small arteries and prevented the progression of hypertension in salt-loaded SHRSP. Vit E also corrected vascular remodeling. These effects were associated with improved antioxidant status and reduced vascular oxidative stress. Thus beneficial effects of antioxidant vitamins in vascular damage associated with hypertension are related, in part, to alterations in vessel redox state.

Key Words: Oxidative stress; vascular remodeling; endothelium

PULSE PRESSURE INCREASES THE RISK OF HEART FAILURE INDEPENDENTLY OF SYSTOLIC BLOOD PRESSURE IN SHEP


The association of increased pulse pressure (PP) with myocardial infarction (MI) and stroke has been attributed to decreased diastolic perfusion and increased pulsatile arterial stress. These factors have not been considered important in causing heart failure (HF). We examined the relationship of pulse pressure to the development of heart failure in the 4700 participants of the Systolic Hypertension in the Elderly Program. Systolic blood pressure (SBP) was a strong predic-
or of the development of HF (p < 0.0001). For each SBP stratum, low diastolic blood pressure (DBP) was associated with increased risk. Cox proportional hazards regression using time dependent covariates and controlling for SBP indicated that HF was inversely related to DBP (p = .01) and directly related to PP (p = 0.01). Data were similar when patients who developed MI were excluded. The increased rate of HF in patients with greater PP may be related to higher impedance (due to a decrease in capacitive component) from arterial stiffness.

Key Words: Impedance; heart failure; pulse pressure

PULSE PRESSURE AND ITS ASSOCIATION WITH DIET: THE NHANES-III SURVEY

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Pulse pressure (PP) is a powerful predictor of cardiovascular morbidity and mortality but the association of PP with diet has not been well studied. We investigated the association of PP and diet using the NHANES-III data on all participants ≥20 years (n = 17,030). The data included demographics, dietary factors by 24 hr recall, and PP (SBP-DBP).

Univariate (UV) and multivariate analyses (MV) were performed using simple weighted, stepwise, and best subset regression as well as principal component analysis. The MV model included interactions for PP was developed using a 50% random sample and then tested on the remaining sample.

The sample age was 48.8 ± 0.2 yrs (mean ± SE) and 53.3% were female. Ethnicity was 41.8% white, 27.6% African American and 27% Hispanic. Body mass index (BMI) was 27.1 ± 0.2. Mean intake for sodium (Na) was 3.3 ± 0.2 g, potassium (K) 2.7 ± 0.01 g, calcium (Ca) 271 ± 4 mg, magnesium (mg) 280 ± 1 mg, protein (Prot) 28.0% 1.4 g, alcohol (EtOH) 43.2 ± 0.8 g, and total kilocalories (Kcal) 2,062 ± 8 kcal. The mean PP in our sample was 51.7 ± 0.1 mm of Hg. Increasing age was associated with an increase in PP (r = .581, p < .001) and the rate of increase (β) was 0.52 mm of Hg/year (p < .001). There was no gender effect (p = 0.9). African Americans had higher PP (+2.33 mm Hg, p < .001). In UV, but not MV, PP was associated with BMI (β = 0.29 mm of Hg per unit of BMI, p < .001) and Mg (β = 0.29 mm of Hg per unit of BMI, p < .001) and Mg (β = 1.6 mm of Hg per g of Mg, p < .001). In the MV PP was positively associated with Na, Prot, and EtOH (p < .001). PP was not associated with K or Ca. With increasing age, the association of PP with Na, prot, and EtOH decreased (p < .001). The association between PP and EtOH was lower in females (p < .001). In the final multivariate model r was .601 (p < .001). The association of PP with modifiable dietary factors (Na, Prot, and EtOH) suggests that dietary interventions may decrease PP and its health risks.

Key Words: Pulse pressure; NHANES-III; diet

PULSE PRESSURE AND DECLINE IN RENAL FUNCTION IN THE SYSTOLIC HYPERTENSION IN THE ELDERLY PROGRAM (SHEP)

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Pulse pressure has been suggested to be predictive of cardiovascular disease. We examined its relation with renal disease in SHEP, a randomized, double-blinded placebo-controlled trial which tested the effect of treatment of isolated systolic hypertension on stroke and cardiovascular disease incidence in 4,736 persons 60 years or older with systolic blood pressure (SBP) ≥160 mmHg and diastolic BP (DBP) <90 mmHg. Serum creatinine levels were available at...